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· July 1929 ·

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No. 7

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JULY,
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We take this opportunity to wish our readers an enjoyable and profitable vacation, regardless of whether this vacation is spent at summer school, traveling, working as a tradesman, or quietly resting at home.

We hope that this relaxation from accustomed labor will contribute toward the mental, physical, and professional upbuilding of every industrial-arts teacher.

The Editors

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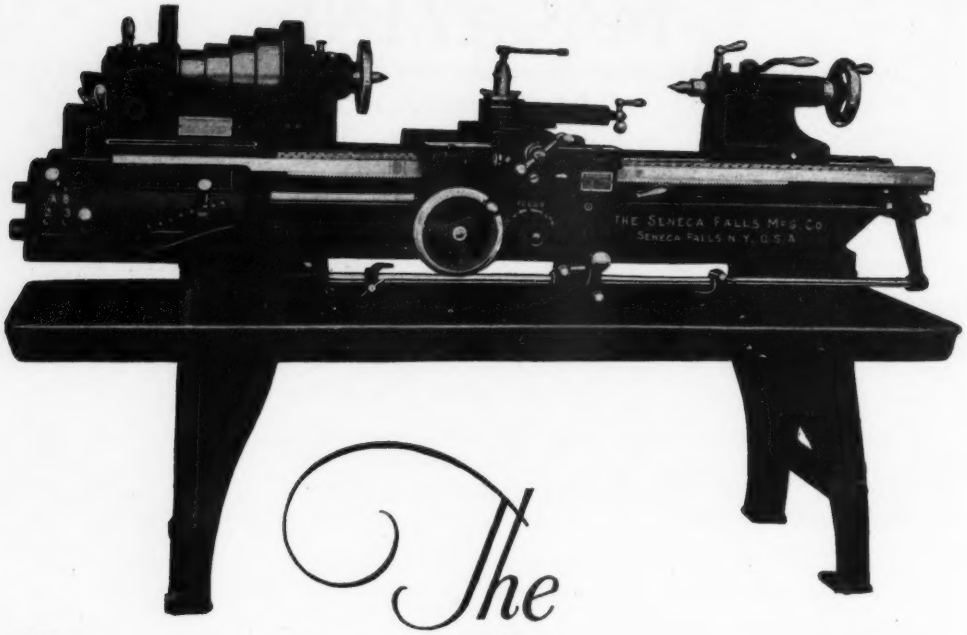

The CHOICE of INDUSTRY

There is one place where machine tools are judged on merit—where the commodity purchased is PRODUCTION rather than MACHINERY—where price differences are weighed against quality and where no machine that cannot stand the gaff has a ghost of a show. That place is INDUSTRY, and to Industry you must look for sound advice on the selection of machine tools for the school shop. For after all, the school shop is but a training ground for Industry itself.

Look about the progressive machine shops in your community — Look out across the production floor and, equally important, look into the tool room. See what kind of machines are depended upon to grind out the day's production — what kind of machines are trusted with the responsibility of maintaining quality and reducing expense. There you will find the answer to your problem.

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THE INDUSTRIAL-ARTS MAGAZINE

Volume XVIII JULY, 1929 No. 7

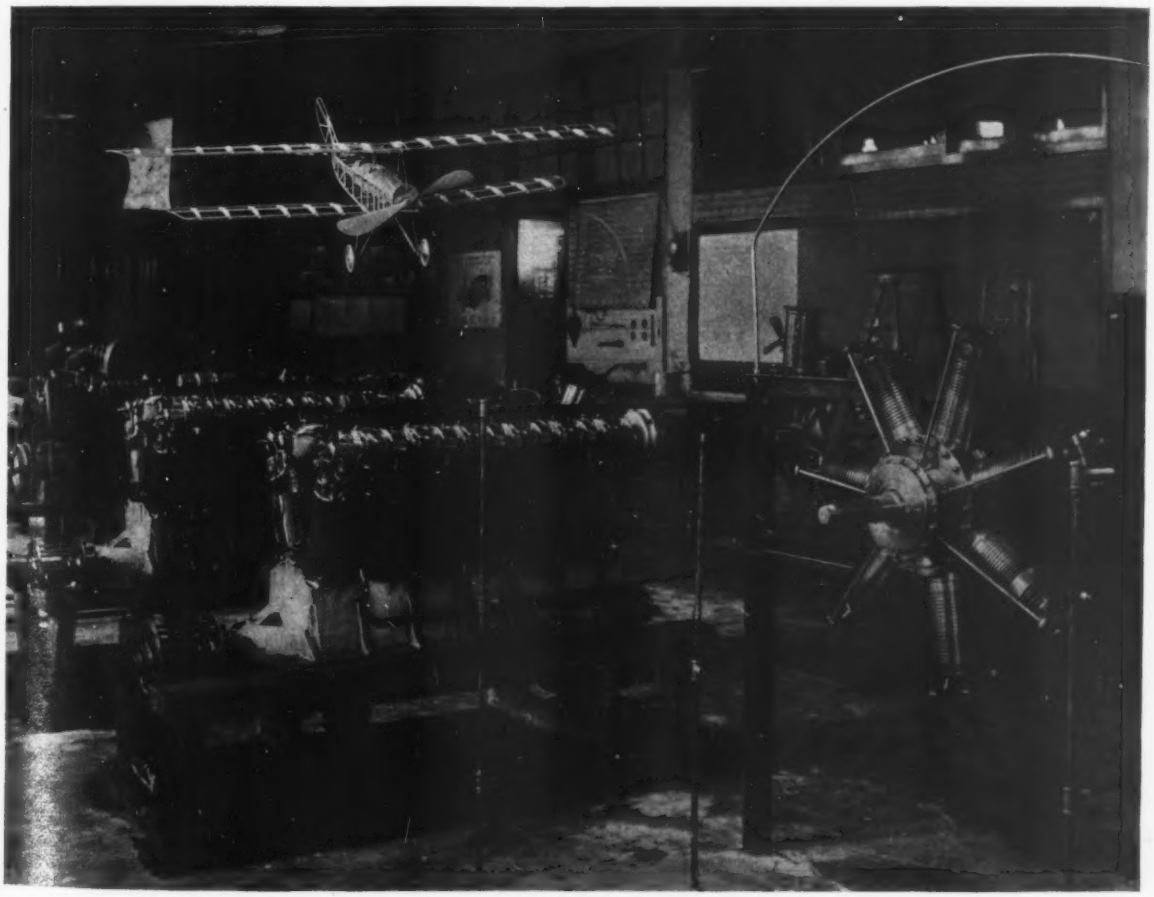
Aeronautics in the High School

S. H. Hurtuk, Morrison R. Waite Senior High School, Toledo, Ohio

AVIATION has probably suffered more from cheap publicity and misrepresentation than any other human activity, but it is now rapidly becoming a popular and safe means of transportation. It is time, therefore, that everyone should have some knowledge of the subject.

The airplane is coming into its own. Today it is both a military and a commercial necessity. With planes passing through the air from city to city, with air mail and express already playing a vital part in the nation's business, a demand has arisen for trained men that has speedily far exceeded the supply. Dozens of different kinds of positions will be available for young men who have specific knowledge of practical aviation.

It is evident that the extensive aviation of tomorrow will depend upon the familiarity and safety with which the young people can deal with aeronautics and the airplane. It is important that the educator should anticipate the situation with respect to aeronautics as soon as possible, in order that he may adjust his educational machinery accordingly, instead of allowing the situation to develop fully before training people



EQUIPMENT IN THE AERONAUTICS SHOP

to meet it. Much of the property loss and many deaths, which accompanied the development of transportation by automobile, could have been prevented with proper education in the public schools coincident with the development of the industry. Some wide-awake educators of the country realize this, and we find them rearranging their educational programs so as to train their student bodies in anticipation of the aeronautical development.

The public acceptance of the airplane will, in the last analysis, depend upon its safety. Eventually we shall have machines that will not fail structurally; they will be under perfect control aerodynamically, and they will be supplied with enough engines so that the source of power will never fail. Perfectly safe aircraft is almost in sight. There will also be improvements in airports just as there have been improvements in roads brought about by the development of the automobile industry.

The present interest in aviation is perhaps more nearly universal than interest in any other one commercial activity. No line of human endeavor so strongly appeals to the juvenile mind as that of aviation. At the recent airplane show held in Detroit from April 6 to 14, the writer was forcefully struck with the great numbers of adolescent youths who crowded the gates for entrance. Once inside, further evidence of their interest was shown by their comments and questions which they put to the demonstrators in charge. At the airport, where planes were taking off on the average of one each minute, the interest of the boys ran high. They used intelligently aeronautical terms which the average adult does not understand. There is no further propaganda necessary now in order to get the boys and girls interested in aviation. The interest is there, and it now remains for the teachers to properly guide their "air-mindedness" into "air-wisdom" in order to secure success.

The Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education, completing a survey of the schools in the United States, found that there are now 206 schools giving some form of aeronautical instruction. These schools are not trying to make everybody aviators, but are taking advantage of the natural interest in the subject. Many courses which are "dead" can be motivated by combining them with aeronautics. It can be correlated with shop, mathematics, science, and other subjects, or it may be taught as a separate subject. Interest in the course may be encouraged by forming clubs where the procedure would be learning history, building models, holding contest flights, etc. There are 85 schools in the United States with such clubs. There are 30 schools giving purely aeronautical courses, 17 evening schools giving aeronautical courses, and 14 schools using aeronautics in correlation with other subjects. These numbers are constantly increasing, however, as more and more schools are joining the forward movement in this new subject.

The fundamental problems confronting the educators in this program are the problems of curriculum and administration, and the problem of teacher training. Many schools already well equipped for auto mechanics can establish aeronautical work at little expense by planning the course to follow closely the automotive course, letting the aero subjects replace the automotive subjects. The progressive instructor will easily make this change in instruction by enlarging his own knowledge along this line. The main point is: American youth *will* fly—it is up to the teacher to keep up to date, and try to make flying as safe as possible by giving valid and worth-while information.

The boy who wishes to enter the aircraft industry should look over the entire field in an effort to decide intelligently which phase of the work interests him most. It is necessary for him to have scientific knowledge of the industry so that he may know whether or not he wishes to enter it as a life vocation. If he decides to earn his livelihood in the industry, he must acquire expert knowledge and skill, sufficient to enable him to enter this field as his vocation. The public school should be able to give the boy enough aeronautical education to enable him to choose and to enter his vocation, but it is also the duty of the school to re-educate, on a secondary-school level, adults who wish to get into aviation. Financial aid for such classes can be obtained in various ways.

At the present rate of development the demands upon the public schools will soon exceed the equipment and teaching forces of the high schools. There is a great need for tested information, analyzed and practically arranged to be used for the teaching content of aeronautical courses in the schools. It will take much time, study, and effort to make the proper job analysis, and intelligent cooperation to accomplish results, and it is to be hoped that the schools and the industry will soon be working together on the problem, carrying out the training on a cooperative basis.

At Morrison R. Waite Senior High School, Toledo, Ohio, aeronautical work is included in the auto-mechanics department and in the woodshop. It may be possible to offer a separate course in aeronautics next year, which will really fill the needs of aeronautical education. This course will be devised to cover the theoretical and technical phase of a ground course. It is the writer's belief that no school should at present attempt to teach actual flight because of the responsibilities which this would involve, the excessive costs which it would entail, and the difficulty of administration, which would be encountered.

It will be seen that the responsibility of teaching this course is divided between two departments: The auto-mechanics department is to teach nomenclature, care and maintenance of airplane engines, trouble shooting, instrument construction, building of scale models, and experimental testing with a wind tunnel. The mechanical-drawing department is to teach various types of aircraft, aviation history, aerodynamics, blue-print reading, elementary airplane design, materials and their properties, meterology, aviation laws, airways, and airports.

Because of the greater educational value to be realized, it is important that boys be taught to design their own planes. The design of model airplanes is based upon exactly the same principles as is the design of full-size craft. It is also of paramount importance that provision be made in the course for instruction in the modern welding methods, because fuselages are

now quite extensively welded up of thin walled tubing, terne plate, and duraluminum sheets. It is desirable to have a stripped chassis in the shop. If this is not available, it is recommended that the students build a six-foot scale model for demonstration purposes. Where the cost of such a chassis is prohibitive, charts may be used to good advantage. Where space permits, gliders may be built. Trips should be taken to airports and airplane manufacturing plants when possible, and advantage should be taken of addresses by authorities from the aeronautical industry and ports.

It is possible to obtain aeronautical equipment from the War Department for industrial purposes, merely by paying the handling and transportation charges.

The course and shop layout which follows, may be adopted either in whole or in part. It must, of course, be adapted to the demands of the particular school and community where it is to be used.

Suggestive Course for Aeronautics

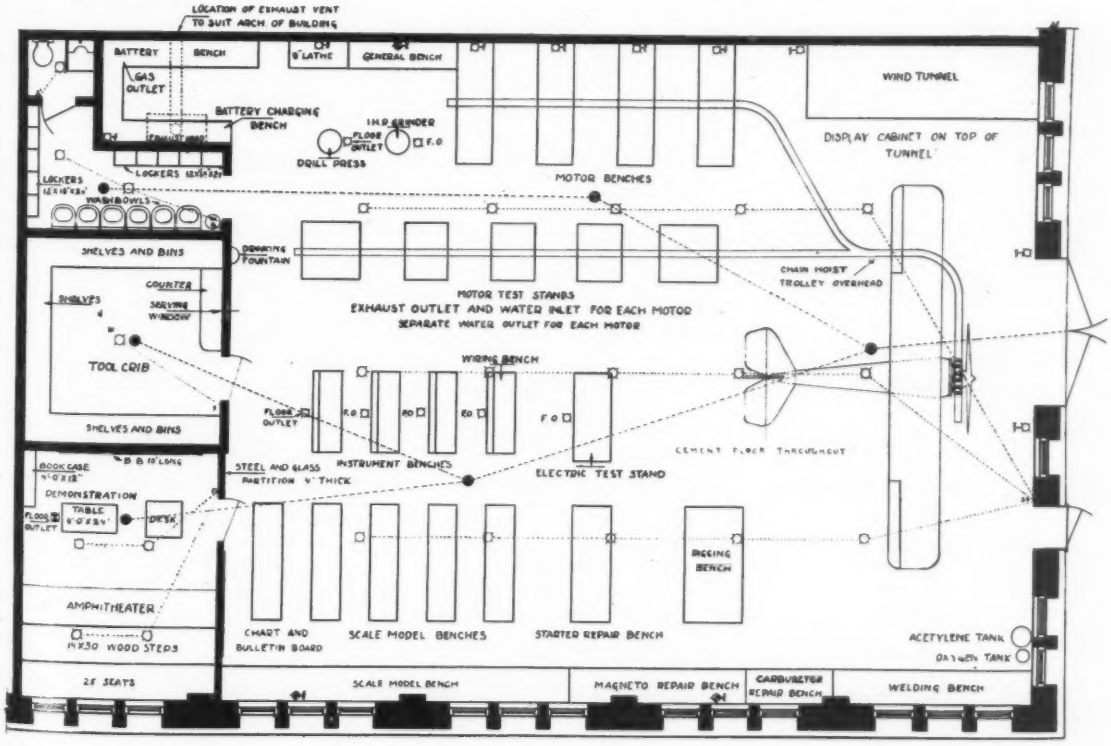
AUTO-MECHANICS DEPARTMENT

A. *Nomenclature*
   1. Aeroplanes
   2. Motors
   3. Instruments
   4. Flight terms

B. *General discussion of engine types*
   1. Radial air-cooled
   2. Radial water-cooled
   3. Rotary motors
   5. In-line motors
   4. X-type motors
   6. V-type motors
   7. W-type motors

C. *Principle of the internal combustion engine*

D. *Care and maintenance of motors*
   1. Motor overhaul
      a) Disassembling
      b) Fitting bearings
      c) Valve grinding
      d) Valve adjusting
      e) Assembling
      f) Inspecting
      g) Testing
   2. Ignition
      a) Battery ignition
         (1) Principle of operation
         (2) Care and maintenance
      b) Magneto
         (1) Application
         (2) General characteristics
         (3) Disassembling and inspection
         (4) Final assembly
         (5) Operation
         (6) Testing
         (7) Charging
         (8) Installing
         (9) Care and maintenance
      c) Dual and single ignition
      d) Timing
      e) Wiring
      f) Storage battery
         (1) Care and maintenance
      g) Generator
         (1) Types
         (2) Principles
         (3) Care and maintenance
      h) Starters
         (1) Types
         (2) Principles of operation
         (3) Care and maintenance
   3. Carburetion
      a) Basic principles
      b) General construction
      c) Carburetor adjustments
      d) Faults of carburetion
      e) Repairs
   4. Lubrication
      a) Gravity system



AERONAUTICS SHOP
FLOOR SPACE 75'-0" X 70'-0"

b) Splash system
c) Pressure system
d) Oil temperature
e) Repairs

5. Instruments—purpose, construction, operation
a) Instrument lights
b) Rheostat
c) Oil-temperature gauge
d) Fuel-pressure gauge
e) Tachometer
f) Ignition switch
g) Oil-pressure gauge
h) Rate-of-climb indicator
i) Steering indicator (galvanometer and voltmeter)
j) Turn indicator
k) Altimeter
l) Air-speed indicator
m) Clock

E. *Trouble shooting*

F. *Building scale models of modern types of units*
1. Fuselage
2. Landing gears
3 Shock absorbers
4. Tail skids
5. Brakes
6. Wings
7. Controls
8. Engine bed mountings
9. Tail groups
10. Rigging
a) Attaching wings
b) Installing struts
c) Connecting and adjusting controls
d) Incidence, angle of
e) Stagger
f) Dihedral, angle of

G. *Controls*
1. Elevators
2. Rudder
3. Adjustable stabilizers
4. Vertical stabilizers
5. Ailerons

H. *Testing in wind tunnel*
1. Airfoil surfaces and scale models

I. *Welding and brazing*

MECHANICAL DEPARTMENT

A. *History*

B. *Aircraft types*
1. The lighter-than-air machine
2. The heavier-than-air machine
3. Monoplanes
4. Biplanes
5. Triplanes
6. Hydroplanes
7. Amphibian
8. Autogiro rotary wing
9. Full wing
10. Three-quarters wing
11. Landing gear

C. *Aerodynamics*
1. Theory of flight
a) Helicopter
b) Ornithopter
c) Aerostat
d) Airplane
e) Autogiro
2. Flow of gases
3. Motion
4. Force
5. Gravity
6. Friction
7. Light
8. Airfoils
9. Balance, stability and control
10. Performance

D. *Blue-print reading of various types of airplanes, balloons, and dirigibles*

E. *Elementary design of airplanes and scale models*
1. Propeller
a) Wood
b) Metal
c) Fabric
2. Fuselage
3. Hulls
4. Pontoons
5. Landing gear
6. Wing design
7. Control surfaces and control methods
8. Stabilizing surfaces
9. Rigging

F. *Properties of various materials used in construction*
1. Wood
a) Spruce
b) Ash
c) Birch
d) Hickory
e) Cedar
f) Mahogany
g) Oak
h) Poplar
i) Walnut
j) Plywood
2. Metals
a) Brazing and welding
b) Tempering of metals
c) Development of alloys
d) Development and success of duralumin

G. *Meteorology*
1. How to read the scale of aviation maps
2. What contour lines mean and their importance
3. Clouds and their meaning
4. Storm causes
5. Air currents
6. Temperature and pressure
7. Cyclones
8. Tornadoes
9. Causes of lightning and thunder

H. *Aviation law*
1. International, state, and local laws and regulations

I. *Airports and airways*
1. Design of landing fields
2. Modern landing field facilities
3. Field and airway management

J. *Navigation or avigation*
1. Problems in course laying
2. Setting the course
3. Allowance for drift

SUGGESTIVE EQUIPMENT AND SUPPLIES FOR AERONAUTICS DEPARTMENT

1 chassis, stripped
1 6-ft. flying scale model of Curtis JN4D-2

Aircraft Motors

1 radial air-cooled motor
1 rotary motor
1 X-type motor
1 V-type motor
1 In-line type motor
1 W-type motor

Aircraft Carburetors

2 Stromberg single-barrel carburetors
1 Stromberg two-barrel carburetor
1 Stromberg three-barrel carburetor
2 Zenith single-barrel carburetors
1 Zenith two-barrel carburetor
1 Bristol carburetor
1 Miller carburetor
2 Superchargers

Aircraft Ignition

4 Scintilla magnetos
2 Splitdorf magnetos
2 Bosch magnetos
1 Siemens magneto
4 Delco battery ignition systems

Starters and Generators

1 high-pressure injector starter
3 electric inertia starters
1 hand starter with booster magneto
1 hand inertia starter, concentric type
6 Delco generators
6 Eclipse generators
6 coils H.T.
6 condensers

Pumps

1 fuel pump
1 air pump
1 lubrication pump

Batteries

2 6-volt batteries
4 8-volt batteries
2 12-volt batteries

Instruments

2 rheostats
1 anemometer
4 magneto switches
2 light switches
4 tachometers
1 altimeter
1 air-speed indicator
1 banking indicator
1 turn indicator
2 compasses
1 speed and drift indicator
1 clock
4 oil-pressure gauges
4 motor temperatures
4 air-pressure gauges
4 gasoline gauges
4 thermometers

Equipment and Tools

1 buffer, 2-h.p.
1 grinder, 3-h.p.
1 drill press, 2-h.p., 21 in.
1 drill, electric portable, ½-in. special
1 hoist, chain, portable, 2-ton cap.
1 gas tank with pump
1 magneto recharger
1 oil container, 25-gal.
1 portable test outfit (ignition)
1 arbor press
1 Universal ignition test stand complete
1 lathe, 9-in., with ½-h.p. motor
1 growler with meter
1 section of wing structure
1 welding outfit
1 brazing outfit
1 lead-burning outfit
1 surface plate, steel, 3 by 2 ft.
3 pair welding goggles
6 spark lighters
2 pair asbestos gloves
2 doz. airplane spark plugs, 18 mm.
1 air-compressor pump and tank
1 soldering furnace
1 combination set, machinists'
2 each, external calipers, 4, 6, and 10-in.
2 each, internal calipers, 4, 6, and 10-in.
2 each, dividers, 2-, and 6-in.
1 set micrometers, outside, 1-, 2-, 3-, 4-, 5-, and 6-in.
1 set micrometers, inside, 0 to 8-in.
1 depth gauge
6 calipers, square pocket slide, 6-in.
2 rules, tempered, 1¼- by 24-in.
1 tape measure, steel, 50-ft.
6 thickness and feeler, gauges (24 leaves)
2 screw-pitch gauges (22 pitch)
1 set adjustable reamers
1 set drills, twist, No. 1 to 60 incl.
1 set drills, straight-shank, 1/32- to 1½-in. incl., by 1/32nds
2 drill gauges
6 each, drills, straight-shank, 1/16-, ⅛-, ¼-, ⅜-, and ½-in.
1 set taps and dies, U.S.S. ¼- to 1½-in. incl.
1 set taps and dies, S.A.E. ¼- to 1½-in. incl.
1 set taps and dies, pipe-thread, ⅛- to 1½-in. incl.
1 set taps and dies, machine-screw, 4–36, 6–32, 8–32, 10–24, 12–24, 14–20
1 doz. monkey wrenches, 10-in. flat
3 sets Ezy-Out
4 each, vise, swivel, 3-, and 4-in.
2 vise, swivel, 6-in.
1 set each, steel letters, ⅜-in. and alphabet letters ⅜-in.
3 sets tappet wrenches
1 set double-end wrenches
1 set heavy-duty socket wrenches
3 sets standard service socket wrenches
1 doz. file handles
2 sets each, magneto, distributor, carburetor, generator, and midget socket wrenches
1 soldering iron, ½-lb., electric
2 soldering irons, irons, ¼-lb.
4 soldering irons, ½-lb.
2 soldering irons, 1-lb.
1 soldering iron, 2-lb.
½ doz. each adjustable, double-end wrenches, 4-, 6-, 8-in.
12 screw drivers, 4-in.
12 screw drivers, 8-in.
6 screw drivers, 12-in.
2 screw drivers, 18-in.
12 hammers, ball-peen, 8-oz.
12 hammers, ball-peen, 1-lb.
6 hammers, ball-peen, 1½-lb.
6 hammers, ball-peen, 2-lb.
6 hammers, lead, 1-lb.
6 mallets, rubber, 4¼-in. long, 2-in. face
6 pliers, combination, 4-in.
12 pliers, combination, 6-in.
12 pliers, combination, 8-in.
6 pliers, end-cutting, 6-in.
12 pliers, side-cutting, 8-in.
6 pliers, end-cutting, 6-in.
12 pliers, side-cutting, 8-in.
6 pliers, long-nose, side-cutting, 6-in.
2 tinners snips, 8-in.
2 tinners snips, 12-in.
½ doz. hack-saw frames, Starrett No. 169
3 sets bearing scrapers (3 to a set)
2 carbon scrapers (3 to a set)
1 grease gun (Alemite)
1 grease gun (Zirk).
6 oil cans, ½-pt. capacity
3 oil cans, 1-pt. capacity
2 oil stones
2 breast drills
2 braces, ratchet
4 screw jacks, ½-ton capacity
4 valve lifters
2 valve grinders
1 doz. center punches, ½ by 5-in.
1 doz. cold chisels, ⅜ by 5½-in.
2 doz. cold chisels, ½ by 6-in.
1 doz. cold chisels, ¼ by 7½-in
3 planes, Stanley, No. 3 with 1-in. blade
2 doz. each, drills, Nos. 77, 72, 70, 67, 65, 60
½ doz. sloyd knives, propeller, 6-in.
½ doz. flexible rules, 6-in.
3 each, pliers, half-round-nose, round-nose, side-cutting
4 waste cans, automatic cover, 5-gal. capacity
½ doz. fire extinguishers, Pyrene
½ doz. fire buckets, 3-gal. capacity (filled with sand)
100 lb. sterilized rags
25 lb. white waste
½ doz. each, files, hand, bastard, 8-, 10-, 12-in.
½ doz. each, files, flat bastard, 8-, 10-, 12-in.
1 doz. each, files, smooth, 10-, 12-in.
1 doz. each, files, round, second-cut, 6-, 8-, 10-in.
½ doz. files, mill, second-cut, 8-, 10-in.
½ doz. each, files, square-cut, 6-, 8-, 10-in.
½ doz. each, files, taper, second-cut, 3-, 4-, 6-, 7-in.
½ doz. each, files, round, second-cut, 3-, 4-, 6-, 8-in.
½ doz. each, files, hand, rough, 10-12-in.
1 gross each, hack-saw blades, Starrett, Nos. 103, 112, 115, 249, 250, 258, 262
2 pkg. each, emery cloth, Nos. 00, 0, ½, 1
2 pkg. each, sandpaper, Nos. 00, 0, ½
6 tubes Prussian blue, 2 oz. each
2 gross each, bolts and nuts assorted sizes, S.A.E. & U.S.S. stove and machine
500 cotter pins
100 each tapered pins and Woodruff keys, assorted sizes
5 sq. yd. vellumoid gasket
6 oz. valve-grinding compound
6 pc. shims, strips, laminated
1 gal. shellac, orange
10 lb. grease
25 gal. motor oil
50 gal. gasoline
1 lb. each, cast iron and bronze flux
½ lb. aluminum flux
36 pc. welding rod, cast iron, ¼ by 18-in.
24 pc. welding rod, mild steel, ¼ by 36-in.
24 pc. welding rod, bronze, tobin, 3/16 by 36-in.
12 pc. welding rod, aluminum, ½ by 13-in.
6 pc. welding rod, brass, ¼ by 13-in.
100 flints, renewals
10 lb. asbestos paper
50 lb. solder, 50–50
25 lb. acid core solder
1 qt. muriatic acid
2 doz. friction tape, ½-lb. rolls
½ doz. rubber tape, ½-lb. rolls
1 gross No. 0 flathead wood screws, ¼ in. long
1 gross No. 1 flathead wood screws, ½ in. long
1 gross No. 2 roundhead screws, ½ in. long
1 pt. banana oil
1 qt. ambroid
1 pt. nitrate
1 qt. acetone
½ lb. each, reed, 3/32-, 5/64-, ⅛-, 3/16-, ½-in. diameter
2 skeins rubber, .045 sq.
2 skeins rubber, 1/32 by 3/16 in.
1 lb. bamboo, 15-in. pieces
10 board ft. balsa
10 board ft. spruce
10 board ft. white pine
¼ lb. each, music wire, gauge Nos. 00, 0, 1, 5, 6, 8, 11, 14, 16
2 doz. tissue paper, Japanese, 21 by 31-in. sheets
2 doz. rice paper, 21 by 31-in. sheets
1 sq. yd. aluminum, .005-in gauge
½ doz. brushes, round, ⅛-in.
½ doz. brushes, flat, ¼-in.
½ lb. each, annealed, tinned wire, Nos. 26, 34

Texts used in this course:

A. L. Dyke, *Aircraft Engine Instructor*

V. W. Page, *Modern Aircraft.*

Available Illustrative Material for Teaching Woodworking

Harlan J. Shufelt, Supervisor Industrial Arts, Racine, Wis.

THERE is a strong feeling among shop teachers of both rural and urban schools that more illustrative material is needed in the teaching of shopwork. Many teachers do not know where to look for such material and, even if they did, would have little time to spend in finding out how it may be secured. With a ready-made list of serviceable material that may be secured at little if any expense other than express charges, the teacher may quickly select what is needed for any given lesson. Illustrative material makes teaching less burdensome, since illustrations often are far more effective than words.

This paper is an attempt to solve the problem for the woodworking teacher.

Suggestions for Using Illustrative Material

How may this illustrative material aid the teacher in attaining the recognized objectives of industrial education? Dr. A. H. Edgerton[1] in his study of 303 intermediate and junior high schools, finds that the main reasons for offering instruction in the industrial-arts and related studies may be given as follows:

1. Contributing to the general experience, all-round development, and industrial intelligence.
   - *a*) Understanding and appreciating economic production in some work;
   - *b*) Gaining respectful attitudes toward the various workers and their work;
   - *c*) Having ability to judge industrial products and do simple repair and construction work, etc.
2. Aiding in the intelligent selection of industrial occupations, without encouraging early choices.
   - *a*) Trying out individual inclinations, interests, and capacities for industrial pursuits through typical experiences;
   - *b*) Making reliable studies of the conditions, demands, and opportunities in related occupations, etc.
3. Enriching the school experience of the pupils through concrete situations.
   - *a*) Having science, mathematics, and other subjects, profit from a better understanding of materials, processes, tools, and machines;
   - *b*) Providing for the individual needs of pupils who would not remain for academic education alone.
   - *c*) Helping pupils more wisely to choose future courses in secondary and higher education, etc.
4. Preparing for entrance into industrial vocations.
   - *a*) Extending the try-out activity to meet the preparatory-vocational needs of pupils who find it necessary to leave school with a minimum of preparation;
   - *b*) Offering greater opportunities for commercial experiences in shopwork by cooperating with outside productive plants during the ninth year, etc.

In this list of objectives certain points stand out very distinctly: General experience; all-round development; industrial intelligence; appreciation; respectful attitudes; ability to judge; selection of industrial occupations; and enriching school experiences. Surely viewing this illustrative material and studying the pictures would enrich the school experiences and prepare the pupil for his vocation, and aid the teacher greatly in attaining the objectives listed.

The following suggestions are offered for the use of this material to the best advantage:

1. Have your shopwork planned at least a month in advance, so you may order in plenty of time and have the material on hand when needed.
2. As many of the reels are not accompanied with descriptions sufficient for the teacher's use, the reels should be run once before being shown to the class.
3. Much of this material will be of interest to the general public and it is possible to show the pictures to parent-teachers' meetings in the evening.
4. Written and oral reports will offer possibilities for cooperation with the English department, for which extra credit may be offered.
5. If one moving picture is shown a month, together with the charts and exhibits which are donated by several companies, the pupils will have a better understanding of modern production, with a fair idea of the part he may take in adult life.

[1] A. H. Edgerton, Industrial Arts and Prevocational Education in Intermediate and Junior High Schools, p. 16. The Bruce Publishing Company, Milwaukee, Wis., 1922.

FILMS

Title	*Reels*	*Charge*	*Description*	*Obtainable From*
From Forest to Newsboy	1	Free	Treats of paper making.	American Museum of Natural History, 77th St. and Central Park West, New York, N. Y.
A World of Paper	2	$ .50	A wealth of material well presented on the advances that have been made in the art of writing, printing, and paper making.	University of Colorado, Department of Vitual Instruction, Boulder, Colo.
Doings of Turp and Tine—No. 1322	1	Free	A paint-brush comedy, portraying the production of gum and steam-distilled wood turpentine.	Y. M. C. A. Motion Picture Bureau, 1116 Center Street, Chicago, Ill.
Brushin' Up—No. 1129	2	Free	A unique description of the growing paint and varnish industry.	Y. M. C. A. Motion Picture Bureau, 1116 Center Street, Chicago, Ill.

Title	*Reels*	*Charge*	*Description*	*Obtainable From*
All the Way with Wall-paper—No. 1278	1	Free		Y. M. C. A. Motion Picture Bureau, 1116 Center Street, Chicago, Ill.
The Manufacture of Wire Products—No. 1116	1	Free	This film shows the drawing of wire and the manufacture of wire products—nails, fence, barbed wire, and rope.	Y. M. C. A. Motion Picture Bureau, 1116 Center Street, Chicago, Ill.
Making Disston Saws, Tools, and Files	3	Free	An interesting motion picture showing details as to how saws, tools, and files are made.	Henry Disston and Sons, Inc., Philadelphia, Pa.
Wood Wisdom	1	Free	Shows the structure of various kinds of wood; cell building in growing trees; structural changes that take place as wood dries or seasons.	Forest Products Laboratory, Madison, Wis.
From Forest to Consumer	1	Free	This shows the lumber industry from cutting of the trees to shipping the lumber to the consumer.	Frank Paxton Lumber Co., Kansas City, Kans.
From Trees to Tribune	5	Free	This film shows immense timber tracts owned by the Chicago Tribune in Canada. Logging operations in Canadian snows; running logs to the paper mills; the manufacture of paper, and the processes of publishing a great newspaper. The picture is very interesting.	Picture Service Corporation, 208 South LaSalle St., Chicago, Ill.
Happiness	2	Free	These reels picture the manufacture of furniture from the tree to the home in story form.	Rockford Furniture Manufacturers Association, Rockford, Ill.
Opportunity	1		A story for your boy, prepared for trade schools of Connecticut. (Worcester Film Corp.)	Connecticut Dept. of Trade Education, Hartford, Conn.
Lumber Jacks	1		This film shows the pictorial beauty surrounding lumbering.	Fox Film Corporation, 850 10th Ave., New York, N. Y.
From Forest to Fireside	1	$ .50	Shows the manufacture of paper, from the felling of trees to the finished magazine, delivered to the subscriber. The close of the reel shows a few sketches of action stories taken from the Youth's Companion.	University of Kansas, Dept. of Visual Instruction, Lawrence, Kans.
Paper Making	1	$ .50	A brief history of the paper industry and its development from the time of the Early Egyptians to the present day.	University of Kansas, Dept. of Visual Instruction, Lawrence, Kans.
Lumbering in the Pacific Northwest	4	Free	Douglas Fir lumber manufacturing; world's largest and newest electrically operated lumber manufacturing plants.	Long Bell Lumber Company, Kansas City, Mo.
The Story of a Stick	1	Free	Logging yellow pine, the saw mill, the finished board, different process in shipbuilding.	Long Bell Lumber Company, Kansas City, Mo.
From Tree to Trade	2½	Free	Complete mechanical processes of modern lumber manufacturing. Logging; dry kiln operations; creosoting. Stump removal and farm building. Part of this picture taken around Mount Shasta, Calif.	Long Bell Lumber Company, Kansas City, Mo.
"Caught"—No. 18-7	1	$1.50 Rental	A picture dealing with the hunted and the hunter; Catching trout; trapping cub bears; the new Brunswick forest; forest fire regulations; how forest fires are usually started; the results of a fire; the forest ranger locating a fire; fighting the blaze; the portable gasoline pump; caught just in time.	University of California, Dept. of Visual Instruction, Berkeley, Calif.
Conquest of the Forest—No. 8-1	1	Free	Educational film showing the lumbering industry of the great Northwest. The film shows in an instructive manner logging and other operations necessary to convert trees into lumber. The film represents painstaking effort in producing the beautiful photographic results.	University of California, Dept. of Visual Instruction, Berkeley, Calif.
Man's Triumph Over the Mighty Forests	1	$1.75 Rental	This film contains some beautiful forest scenery. It covers the lumber industry in and around Kennebec River region of Maine; methods used in overcoming log jams; intimate scenes in the everyday life of the lumberjack.	University of California, Dept. of Visual Instruction, Berkeley, Calif.
The World of Paper	2	Free	The evolution of writing from Egyptian hieroglyphics to the Roman alphabet. Egyptian making papyrus. How Chinese made pulp of mulberry tree (A.D. 105). Guttenberg's process in the thirteenth century. The first book ever printed—the Guttenberg Bible, 1450-1455. Greek Bible	University of California, Dept. of Visual Instruction, Berkeley, Calif.

Title	*Reels*	*Charge*	*Description*	*Obtainable From*
			published A.D. 1518. Present-day manufacture of paper from felling of trees; the making of wood pulp to the finished paper.	
Taking to the Tall Timbers—No. 8-6	1	$ .50	Lumbering on Vancouver Island; Logging railroad; sawing big trees; snaking out logs; unloading train at storage pond; transporting logs to mill; sawing logs into boards; "the steam nigger"; lumber yard.	University of California, Dept. of Visual Instruction, Berkeley, Calif.
Out of the Woods	1	$ .50	Lumbering in winter; the logging train; barren land shorn of timber; lumberjacks; keeping road in condition; loading twin sleds and transporting to railroad; loading cars; transporting logs via streams; breaking up a jam.	University of California, Dept. of Visual Instruction, Berkeley, Calif.
The Miteor	2	Free	The story of the crosscut saw.	E. C. Atkins and Company, Indianapolis, Ind.
Tooth, Serpents	1	Free	The story of the handsaw.	E. C. Atkins and Company, Indianapolis, Ind.
Ancient Industries	1		Arts and trades that have survived the centuries.	American Motion Picture Corporation, 130 W. 46th St., New York, N. Y.
Arapahoe National Forest, Lumbering Pine on the Colorado	1	Free	How government timber is cut under regulation.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
The Cost of Carelessness	1	Free	A lesson to campers. Prevent devastating forest fires.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
Forest Green or Forest Gray	1	Free	The uses of national forests, particularly the recreational uses; and how campers, trampers, and tourists can protect them from fire for the benefit of themselves and future generations.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
Work of the Forest Products Laboratory	1	Free	Work of the Forest Products Laboratory, Madison, Wis. The preservative treatment of timber; the manufacture of paper from wood waste. Methods of service to the manufacturer.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
Work of the Forest Products Laboratory	1	Free	Picturing timber testing, the preservative treatment of timber, and the manufacture of paper from wood waste, as seen in the Forest Products Laboratory, Madison, Wis.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
Pine—From Seed to Sawmill	2	Free	Tells of the service which the southern pine has given in the development of our country. Many beautiful scenes of Magnolia Gardens, Charleston, S. C.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
What the Forest Means to You	2	Free	Designed to set forth the dependence of mankind upon the forest and the evils that follow in the wake of total destruction of forest cover.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
Logging Eastern White Pine	1	Free	Methods of logging and lumbering as practiced in Pennsylvania. Portable saw mills in New England; old-fashioned water-power mill of colonial days.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
White Pine—The Wood of Woods	1	Free	Eastern white pine from log to lumber, illustrating its wide range of usefulness. Lumber yards; stave and box factory; making screen doors; window screens; boxes; barrels; and buckets.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
Winter Logging in the White Mountains	1	Free	Utilization of timber in the White Mountain National Forest, N. H. How the lumberjacks live and work.	U. S. Dept. of Agric., Division of Agriculture, Washington, D. C.
Films of Wallace Woodworking Machinery in Operation		Free	These pictures show very clearly woodworking machinery in operation.	J. D. Wallace & Company, 134 California St., South, Chicago, Ill.

BOOKLETS

Title	*Charge*	*Description*	*Obtainable From*
The Story of the American Walnut	Free	This includes a table of period furniture.	American Walnut Manufacturers Association, 616 So. Michigan Ave., Chicago, Ill.
Saw Sense, also small booklets on Saws	Free		E. C. Atkins and Company, Indianapolis, Ind.
Simonds Guide	Free	Contains 60 pages of material on: Roof framing tables; how to set and file a saw; stair building; table of board measure, etc.; band saw; circular saw; saws; knives; files; hacksawology; file facts; and the crosscut saw.	Simonds Saw Company, 127 South Green Street, Chicago, Ill.

Title	*Reels Charge*	*Description*	*Obtainable From*
The Story of Shellac	Free	Explains where and how obtained, uses, etc.	William Zinsser and Company, Chicago, Ill.
Wood and the Piano Builder's Art	Free		American Steel and Wire Company, 208 South LaSalle St., Chicago, Ill.
The Book of Lawn Furniture Farm Building Book Remodeling Suggestions for the Home Building Small Farm Structures			Long Bell Lumber Company, Kansas City, Mo.
A Captain of Industry	Free	Contains a story of David Maydole, inventor of the adz-eye hammer. There are 71 pages of valuable material.	Massachusetts State Forestry Assn., Boston, Mass.
Concrete Around the Home	Free	Explains with illustrations and descriptions how forms should be made.	Portland Cement Association, Chicago, Ill.
The Story of Making Rockford Furniture	Free		Rockford Furniture Mfg. Assoc., Rockford, Ill.
The Romance of Rubber	Free	Story of early discovery, and different products which come from the rubber tree.	United States Rubber Co., Box 12, Station G, New York, N. Y.
Crescent Woodworking Machinery	Free		Crescent Woodworking Machinery Co., Leetonia, Ohio.
Manufacture of Auger Bits	Free		Greenlee Brothers and Company, Rockford, Ill.
General Tool Catalogs	Free		Greenlee Brothers and Company, Rockford, Ill.
Solar Job Sheets for Classwork	Free		J. D. Wallace and Company, 134 California St. S., Chicago, Ill.
Beautiful Birch for Beautiful Woodwork	Free	Sixteen pages showing interior of homes done in birch.	Northern Hemlock and Hardware Mfg. Assn., Oshkosh, Wis.
Hard Maple in the Industries	Free	Well illustrated, explains characteristics of hard woods, also contains tables of weights.	Northern Hemlock and Hardware Mfg. Assn., Oshkosh, Wis.
Making Things	Free	Seventy-two pages, part of contents are: Doing things; the value of a plan; lumber required; cutting parts, etc. The last part of the booklet is on rope tying.	International Harvester Co., Harvester Bldg., Chicago, Ill.
Some Useful Things You Should Know	Free	A figure-four trap. Binding a broken handle.	International Harvester Co., Harvester Bldg., Chicago, Ill.
The Proper Treatment of Floors	Free	Job sheets on wood finishing obtained with purchase of stains.	S. C. Johnson and Son, Racine, Wis.
The Disston	Free	Forty-seven pages showing pictures of different woodworking tools, with full description.	Henry Disston and Sons, Inc., Philadelphia, Pa.
Turpentine and Rosin	Free		Forest Products Laboratory, Madison, Wis.

The following booklets on logging, distribution, and use of timber, lumber, and other wooden products may be obtained from the Forest Products Laboratory, Madison, Wis.;

Preservation.
Pulp and Paper.
Timber Physics.
Timber Mechanics.
Wood Technology.
Notes on the Manufacture of Plywood.
Lumber Value of Pine Trees not Affected by Turpentining.
The Manufacture of Veneer.
Standard Terms for Describing Wood.
Average Weight of Various Species of Wood.
How to Retain Bark on Logs Used in Rustic Construction.
Decay of Lumber and Building Timber.
Difference Between Heartwood and Sapwood.
Dry-Rot in Buildings and Stored Construction Materials and How to Combat it.
Factors Affecting the Strength of Wooden Members.
Grain of the Wood with Special Reference to the Direction of the Fibers.
What is Dry-Rot?
Shrinkage and Swelling of Wood.
Sap Stains and Molds on Lumber.
Causes and Prevention of Blue Stain.
The Yellow Stain on Hardwood.
Removal of Glue Stains.
Sunken Joints in Furniture Panels.
Grading Rules and Working Stresses for Structural Timbers.
Comparison of Commercial Grades and Forest Service Basic Grades.
Utilization of Blue Stained Lumber.
Veneered and Solid Furniture.
Properties and Uses of Some of the More Important Woods Grown in Brazil.
The Characteristics and Uses of Western Red Cedar.
Fuel Value of Wood.
Lumber, Lath and Shingles. 5 cents.
Forestry and Forest Products.

Number	*Title*
F-2	The Strength of Commercial Liquid Glues.
F-4	Water-Resistant Glues.
F-9	Foamy Glue.
F-11	Gluing Veneer at High Moisture Contents.
F-32	A Test of the Jelly Strength of Glue.
104	Overheating Reduces Strength of Animal Glue.
131	Properties of Ordinary Wood Compared with Plywood.
139	Sunken Joints in Furniture Panels.
140	Stresses in Laminated Wood Construction.
146	Removal of Glue Stain.
149	Strength of Screw Fastenings in Plywood.
170	Copper Salts Improve Casein Glue.
184	Utilization of Blue Stained Lumber.
193	Starved Glue Joints.
197	Veneered and Solid Furniture.
202	Water-Resistant Gold Press Blood Albumin Glue.
207	Glues for Use with Wood.
211	Strong and Weak Joints Made with Animal Glue.
223	Factory Method for Testing Hardness of Glue Joints.

The following mimeographed material and reprints may be obtained free upon request from the Forest Products Laboratory, Madison, Wisconsin. Please give both title and number.

Number	*Title*
30	Vegetable Glue—By Don Brouse.
40	Water-Resistant Animal Glue—By F. L. Browne.
216	Conditions Affecting Making of Glued Joints.
280	Casein Glues—Their Manufacture, Preparation, and Application.
281-2	Blood Albumin Glues—Their Manufacture, Testing, and Preparation.
284	Important Factors in Gluing with Animal Glue.
285	Manufacture of Veneer.
475	Drying of Plywood Panels.
492	Animal Glues—Their Manufacture, Testing, and Preparation.
543	Notes on the Manufacture of Plywood.
819	A Water-resistant Animal Glue. Effect of Wood Structure on Glue Penetration—By Eloise Gerry and T. R. Truax.
	What Makes Glue Stick—By E. Gerry and T. R. Hruax.
	Which Glue Will Give Me the Least Knife Trouble?—By Don Brouse.

The Forest Products Laboratory at Madison, Wisconsin, will mail you free a list of publications having to do with the following subjects:

Wood Preservation.
Mechanical Properties of Timber.
Pulp and Paper.
Seasoning of Wood.
Structure and Identification of Wood.

TECHNICAL NOTES

Technical notes may be secured from the United States Forest Products Laboratory at Madison, Wis., for $1.00 per set. Individual copies are sent free upon request. Technical notes as follows:

Methods of determining moisture content of wood.
Average of various species of wood.

SLIDES

Subject	*Number of Slides*	*Charge*	*Description*	*Obtainable From*
Manufacture of Paper and Making a Big Daily Newspaper	31	$ .50		University of Colorado, Dept. of Visual Instruction, Boulder, Colo.
History and Manufacture of Furniture	60	Free		Rockford Furniture Mfg. Association, Rockford, Ill.
Paper Making—Set No. 399	40	$1.00 for three days	These slides show all of the processes in making paper from the tree to the finished product ready for shipment. A lecture accompanies the slides.	Victor Animatograph Company, Davenport, Iowa.

EXHIBITS

Subject	*Charge*		*Obtainable From*
Small collection of common woods for loaning to public schools and members of the museum	Free		American Museum of Natural History, 77th St. and Central Park West, New Nork, N. Y.
Main Operations in the Manufacturing of an Auger Bit	Free	This exhibit shows 45 operations, but a dozen more specimens are mounted on a board.	Greenlee Brothers and Company, Rockford, Ill.
Display of Finished Wood Panels	Free		S. C. Johnson and Son, Racine, Wis.
Charts on Wood Joints and Planes and Other Tools	Free		Stanley Rule and Level Company, New Britain, Conn.
Wallace Portable Woodworking Machines	Free		J. D. Wallace and Company, 134 California St., South, Chicago, Ill.
Demonstration Saw; may be secured by using school letterhead	Free for 8 weeks or purchased at $3.50		E. C. Atkins and Company, Indianapolis, Ind.
Charts on all tools made	Free		Henry Disston and Sons, Inc., Philadelphia, Pa.
Kiln Drying Wood Distillation Wood Preservation	Free upon application, for special occasions such as expositions		Forest Products Laboratory, Madison, Wis.

Locating Vanishing Points in Perspective Drawings

Frank W. Walsh, State Teachers' College, Oshkosh, Wis.

PART II

MANY instructors of perspective drawing call attention to a solid or object to be drawn, and ask their students to hold a straightedge horizontally between them and the lower front corner of the object. They say, "Now notice that the edge of the straightedge and the lower edges of the object make a certain angle. The lines of the object run out to vanishing points, somewhere to the right and left." They dismiss the whole subject of vanishing points with this brief statement. This would be excusable if it were not so easy to locate them definitely. They can be located with the same degree of accuracy as any other points on the object which is being drawn. When they are definitely located, it very greatly simplifies the making of the drawing. This fact is made use of by architects in making perspective drawings for their clients.

The question arises, Where shall we look for vanishing points? It does sound strange when we say that we are "looking for vanishing points." All books on perspective drawing take up the definition and illus-

tration of foreshortening. They illustrate by drawings of railroad tracks, rows of trees, rows of buildings, rows of windows, etc. This is all well done and is so generally understood that it will be dispensed with in this article on the supposition that it is understood by those who are most liable to read the article, because both time and space are precious.

Let us observe a student who is looking for vanishing points for an object that he is about to draw. To aid yourself in reading and understanding what is seen, it would be excellent if you could place yourself in a similar position to that of the student in Figure 1. The student is facing the corner of a folding drawing desk which stands in the corner of a room. He purposely stands so that he can see the reflection of his eyes in the glass of the bulletin board which hangs on one wall, and in the glass door of the cabinet which stands before him against the other wall. Any glasses or mirrors will do for this little piece of apparatus. The reflections thus come from two walls that are at right angles to each other. Any rectangular object may be used in lieu of the desk.

Notice that when the student looks to the right, he sees the reflection of his own eye at B, and if he looks to the left, he sees his eye reflected at D. The student, and perhaps you, will say, "What of it?" These points of reflection of the eyes of the student are marked with a white spot so that you can see them in the picture. They are very important, because they are what we are looking for. *The vanishing points that the student will use when he makes the desk drawing.*

Now let us prove that these points are the desired vanishing points. Line AB is drawn from the student's eye to the reflection of his eye in the glass at the right. This line is perfectly horizontal. The wall and glass in which he sees his reflection are vertical. Line CD is drawn in the same way, only to the left reflection. Line CD is also horizontal, because the door in the cabinet is vertical. We draw line DB and this line is on the boy's eye level. It extends from the left vanishing point (L.V.P.) to the right vanishing point (R.V.P.) and, indefinitely, beyond each.

Now look at the line that is drawn vertically from the front corner of the desk top until it crosses the level of the eye line at O. This point O is called the "center of vision" (C.V.). Point O is directly in front of the boy, above the front corner of the desk and on the level of the boy's eye.

Line EF is drawn along the desk-top edge and continued in the direction of the right vanishing point (R.V.P.). Line GH is also drawn along the feet of the desk and continued toward the right vanishing point. Lines EF and GH, as well as all of the lines on the desk parallel to them, are parallel to the line AB and if extended toward B would meet in a common point B, which is the right vanishing point.

Line EJ, along the edge of the end of the desk top, and GK, along the feet of the desk, are drawn toward the left vanishing point (L.V.P.) at D. EJ and GK are parallel to each other and to CD.

Now, to show that lines EF and GH, when extended, meet at B, the right vanishing point, and that lines EJ and GK meet at D, the left vanishing point. Hold a string, which is attached to B and D, between your eye and the corner of the desk E. When this is done, the two strings will intersect each other at M. Also hold the string between your eye and the lower front foot of the desk G, as at N. When the string is held taut, as at DMB, then CME is a straight line, and when you sight along the line MB or MD from C, you will notice that line MB coincides with line EF and line MD coincides with FJ. Lower the string so that N is between your eye and corner G. Lines NB and GH coincide, also ND and GK, and all lines of the desk that are parallel to these lines run to their same vanishing point. If you haven't a string, hold a yardstick or straightedge between your eye and the desk edge. Bring the yardstick close enough to you that it will reach from E to B, when you sight to those two points.

EF is a horizontal or level line, while AB is also a horizontal line. Since all of the lines of the desk that are parallel to EF or to AB appear to converge at the vanishing point B, and all of the lines of the desk that are parallel to EJ or to CD appear to converge at the vanishing point D, we may therefore, conclude that the vanishing point of any line will be found at a point in space on a line drawn from the observer's eye parallel to the given line.

If lines are horizontal, their vanishing points will always be found on the eye level, which is a horizontal line on the level of the observer's eye. This is illustrated in Figures 2 and 3. The camera which was used for obtaining the pictures for these two illustrations, was placed on a stepladder. Figure 1 was taken with the lens as high as O, then it was lowered to position O in Figure 3 for the next picture. Notice that the lines AO, BO, CO, and DO in the pictures correspond and run in the same way to a common vanishing point O was pointed out by the boy with his yardstick while the picture was being taken which

was before lines AO, BO, CO, and DO were drawn.

For you as an observer, let us think of the desks in the same way as you did in Figure 1. If you should climb a ladder or sit down on a low stool at one end of a room and look directly across the room along a horizontal line, you would get a reflection of your eye should you place a mirror on the opposite wall. Suppose you take the mirror away and imagine that your eye is reflected from the bare wall, from a window curtain, from a window pane, or from a spot on the landscape outside the window. This will be the vanishing point for every line that is parallel to the line along which you are looking across the room. All lines in the room appear to converge at that point if they are parallel to each other and to the line along which you are looking.

In Figures 2 and 3, the desk-top ends form a perfect straight line from A to O, while at the same time, the bottom lines of the desk form a straight line from D to O. The lines of the floor, as CO, or the beams of the ceiling, like BO, all meet at the common point O. This is the desired vanishing point to be used for drawing the lines of the ends of the entire row of desks. It makes no difference whether a horizontal line is above or below the eye level of the observer, its vanishing point always will be found on his eye level. In Figure 2, AO slants or comes up to the eye level at O, while in Figure 3, the same AO slants or comes down to the eye level at O.

While we are at it, we will locate vanishing points for lines that are not horizontal. Let us suppose that the desk tops are raised at the back, and the fronts are left in their regular position in Figure 2. Now the line AO would not conform nor coincide with the end edges of the desk tops, but would still pass through the lower front corners of the row of desk tops.

In order to locate the vanishing point for lines of the ends of all of the desks after they are equally inclined, we must look directly above O far enough so the line along which we are looking is parallel to the slanting lines of the ends of the desks. The point N appears to be the correct spot or point above O that would be on a line from the observer's eye parallel to AE. To verify this, hold a yardstick so that the left end is between your eye and A, while the right is between your eye and N. Sight along the edge of the yardstick and if its edge coincides with AE, then N is the proper point. If it does not coincide, raise or lower point N away from or toward point O until the straightedge coincides. N is then the vanishing point for all of the slanting lines of all of the desks in the row.

It is the sincere wish of the writer that this short article has been of benefit to the reader in his quest of vanishing points. The knowledge gained in this article will be utilized in part III, "Making a Perspective Drawing by Means of Definite Vanishing Points," which will follow in an early issue of the INDUSTRIAL-ARTS MAGAZINE.

Farm Mechanics Popular in Texas Schools

M. F. Thurmond, A. and M. College of Texas, College Station, Texas

FARM MECHANICS has become a very important part of the Smith-Hughes agriculture work in Texas. There are over 235 schools in the state that are teaching vocational agriculture. In these schools there are 195 that have shops where they do the ordinary mechanical work that occurs on the farm.

The shopwork, as it is given in the high school, is usually linked up with the boy's home project. The student who has a poultry project may be interested in building a poultry house, or if he has hogs for his project, he might want to build a self-feeder, a feed trough, or a water trough.

There are many other jobs that are a part of the regular farm practice in mechanics. The harness is repaired, oiled, and harness racks built. The farm fences and gates are kept up. The tools are sharpened and cared for and this necessitates building tool boxes or cabinets. Many soldering jobs, such as repairing buckets, kitchen utensils, radiators, and other minor jobs are done.

Farmers are building now for permanency and this means that concrete work is not overlooked in the regular course. The building of water troughs, sidewalks, foundations, floors, and curbs, make up jobs that are done in this line of work.

Simple farm buildings, such as poultry houses, hog houses, farm-machinery sheds, garages, and other light buildings, constitute the work that vocational-agriculture students are doing from time to time. With this kind of construction work, boys learn how to frame buildings and cut rafters.

Most of the farmers today have automobiles and the students are taught the simple fundamentals of auto mechanics. They do not study the work from the skilled mechanic's viewpoint, but are able to understand the simple ignition systems, valve grinding, and the general care of the car.

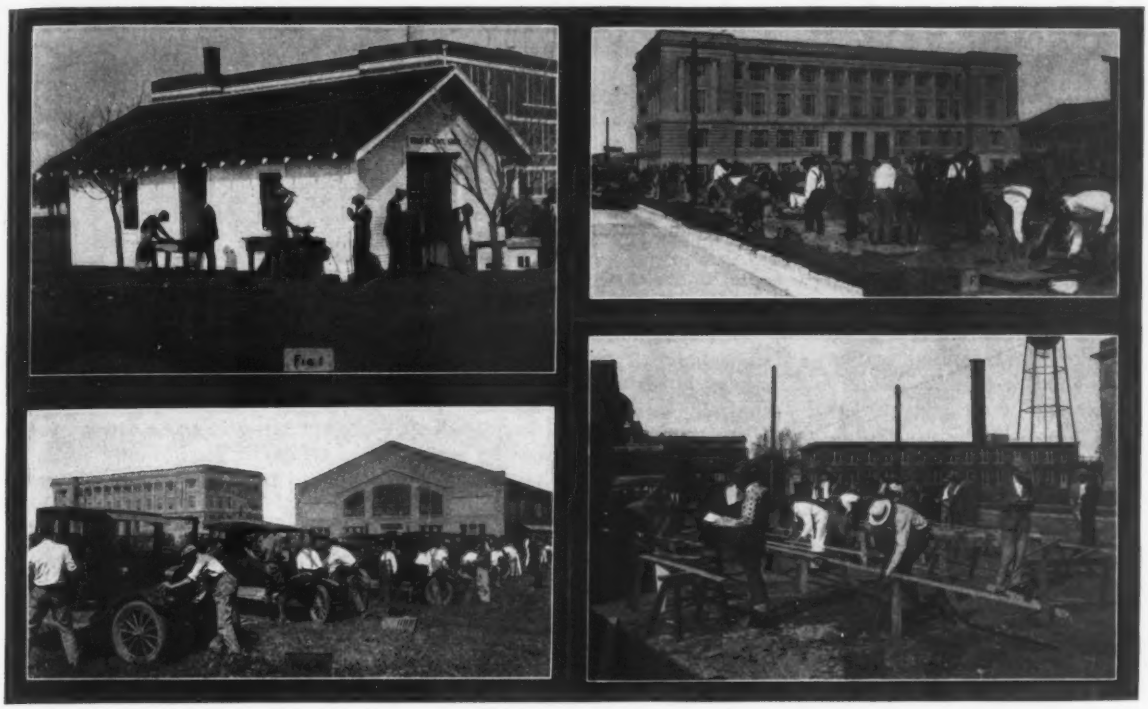
The boys study hardware from the farmer's standpoint. They learn the different kinds of tools, bolts, nails, screws, hinges, handles, and other articles that are used on the farm.

There are many other jobs, such as making field appliances, orchard appliances, home conveniences, the repairing of farm machinery, terracing and drainage, that are included in the farm-mechanics course.

The picture of the shop shown in Figure 1 is a typical example of one of the 195 shops where the vocational-agriculture boys are doing farm mechanics.

This shop was constructed by the boys shown in the picture. The cost of the building was $375. The shop is equipped with $350 worth of tools.

Each year an annual contest in farm mechanics is held in April for the vocational-agriculture schools at the Texas A. and M. College. In 1928 there were 126 boys who entered this contest. They represented 42



schools. Some of these schools are located over 1,100 miles apart.

One division of the contest was the identification of hardware. Such articles as bolts, nails, screws, pipe fittings, handles, kinds of wood, tools, and the general hardware articles were placed before the contestants and they were asked to give the name, size, and use.

In the concrete work, the boys were questioned in regard to the proper mixtures to be used for different articles. They also were questioned on curing, placing, and reinforcing. Figure 2 shows the boys working in teams, making 4 by 18 by 24-in. concrete slabs. Each team was graded upon the way in which its members measured, mixed, placed, and finished the concrete mixture.

In the soldering contest each boy was given a piece of sheet metal. With this, he made a pan, and placed a handle on it. He then patched a large hole and soldered several small ones. All of the necessary materials were placed before the boys at the beginning of the contest. The soldering coppers were ground off and it was necessary for the contestant to tin the copper before it could be used. Each boy had to know how to use the proper flux. They were graded upon workmanship and the time required to complete the job.

Figure 3 shows the rafter-cutting contest in which each contestant was given a piece of 2 by 4 in., 18 ft. long. Following his printed instruction sheet, he cut two rafters, one for a gable roof and the other for a shed roof. A frame was made the exact size of the buildings for which they were cutting rafters and each boy nailed up his two rafters. Here the boys compared their rafters with the others and could see just how they ranked.

In the saw-filing contest, each boy was given a saw-filing practice strip. On one side of the strip were the ripsaw teeth and on the other side, the crosscut teeth. The contestant set and filed two inches of each kind of teeth. They were graded upon the basis of a properly fitted saw and on time for doing the work. In this contest it was very easy to find the teams that had received proper instruction in saw filing.

The automobile contest shown in Figure 4, was limited to trouble shooting. The object was to start the car, place it in perfect running order, and run it around the block.

The troubles found were to be listed and turned in to the judge. They were allowed 45 minutes to find all the troubles, list them, and make the proper adjustments.

The winning team in this contest placed the car in perfect running order in 27 minutes. Among the eight things that were wrong with the car, were the following: A worn timer roller, defective spark plugs, points on coils in bad condition, ignition not properly wired, a defective magneto post, carburetor out of adjustment, and the low gear out of adjustment.

Fords only were used in this contest. In addition to the trouble shooting, each boy was asked to identify by name 20 parts of the car.

A trophy was awarded to the team that scored the greatest number of points. Cups were awarded to the winning teams in soldering, hardware, saw filing, rafter cutting, concrete, and automobile work. The high-point man in rafter cutting was awarded a steel framing square, while the winners of the saw filing received handsaws.

The winning team of the shop contest, McLean High School, coached by A. A. Tampke, scored 1,491 points out of a possible score of 2,100. This team carried away the cup for the entire contest, and also won the cups in rafter cutting, and concrete work.

INDUSTRIAL-ARTS MAGAZINE

EDITORS

E. J. Lake *J. J. Metz* *S. J. Vaughn*

THE VISION

We had a little time between trains and entered an art gallery to spend this time in an enjoyable manner. There were new pictures and old, and judged by our rather limited artistic sense, some of them were good, others bad, and still others indifferent. Before one of the pictures sat a young lady, her face expressive of the rapt attention which she was bestowing upon the work of art. A closer study showed that the picture really was quite worth while. Nevertheless, it did not differ materially from dozens of others hung on the same wall.

This occurrence, as occurrences occasionally do, started a train of thought. How much did the sight of this young lady, attentively studying that picture, and apparently discovering therein that which the casual visitor did not see, resemble what we teachers are striving to do? Are we not working day in and day out by means of the tools and materials which we place in the hands of our students, to build up in them the capacity for seeing a vision greater than merely tools and materials? Are we not striving to do more than merely teach processes and methods? Do we not hope through our work to touch the lives of our students; and is it not our faint hope that we may touch them so that they too may see a vision of greater things at some time in their lives? Is it not one of the reasons why teachers remain at their jobs even in the face of greater promises elsewhere, because the privilege of implanting the power to see visions into the minds of the young, seems to outweigh by far anything that mere money can buy? Is it not a wonderful fact that we teachers frequently find that the visions that we permitted our students to see, have developed some student so that he may see even greater visions than those that have been afforded to us, their teachers?

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TRUTH STRANGER THAN FICTION

It all came about through a talk with the teacher of architectural design. He put us in a pettish mood by saying off-hand, "There have been no important changes of style in building that have not been the direct result of changes in materials used and in the purposes for which buildings were built."

"Material and use then are the measure of art?" asked the skeptic.

"Yes!" replied the designer confidently. "Read Le Corbusier on 'Forward a New Architecture.'"

We did read it; and we read such statements as these: "Architecture is stifled by custom;" "The styles are a lie;" "Style is a unity of principle animating all the work of an epoch, the result of a state of mind which has its own special character;" "Our own epoch is determining, day by day, its own style. Our eyes, unhappily, are unable yet to discern it."

Then we listened in on a description of some of the schemes for a great World's Fair for Chicago in 1933. "Great illuminated glass tows made irridescent by electric lighting." "Canals illuminated from below the surface of the water." "Buildings designed for entrance from the top story for air transportation." "Moving sidewalks to save weary feet." "Islands dredged up and built up out of Lake Michigan."

A wild dream you say? No! Only the use of materials at hand to serve a very definite purpose.

Then we went to the talking movies, and saw and heard the sights and sounds of foreign lands and peoples to better advantage than the tourist could see and hear them while traveling in those foreign lands. We saw uncanny visions of things that only appear in dreams and heard sounds produced by strange instruments of past generations. Ah! Ghost of Aladdin! Why should the artist dream dreams or the artisan work hour by hour to secure a particular and peculiar effect when his most individual and unusual production will be commonplace tomorrow?

The world moves in reality faster than the keenest imagination can predict. The design of tomorrow may be this or that strange and beautiful vision, but it is not possible to predict the sights and sounds that our children and their children will witness. And yet! These strange, unimaginable sights and sounds have been made possible by the ingenious mind of man. Science and art together have made and will make truth stranger than fiction.

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SUMMER SCHOOL

Among the many advantages which the industrial-arts teacher derives from attendance at summer school, there is one which ordinarily is lost sight of, but which really deserves a better fate. Whenever the discussion about summer school comes up in any group of teachers, there are numerous comments about this or that professor. The one teacher is loud in the praise of a certain instructor whom he had the summer before and he advises each and everyone of his friends to take up the course which that particular instructor gives. Another teacher who had a less enjoyable experience with a different instructor, advises his friends not to take up a certain course in such and such a teacher-training school because the instructor is a grouch, or because the instruction is not up to par. In other words, whether the group of students is composed of teachers who attend summer school or whether it is composed of pupils who attend our own classes, the instructor with his good or bad points, his mannerisms and his characteristics, is freely discussed and frankly criticized.

It is a good thing then, if we who undertake to teach, go back periodically and assume the status of a student. In this manner we are enabled to measure up the characteristics which make us like the one instructor and dislike another. It not only allows us to make comparisons, but it also gives us an opportunity, by a little self-examination, to discover our

own failings and thus to improve our work by eradicating them. Unfortunately, however, while we criticize our summer-school instructors for being sarcastic, we may not stop inflicting sarcasm on our own students. We may criticize the assignments which the summer-school instructor makes, and yet we continue to assign impossible tasks in our classes, simply because they keep the student busy and makes our work apparently a little easier.

It is a wise idea, therefore, when attending summer school, to keep in mind that we can learn what to do, as well as what not to do, by observing the instructors with whom we get in contact. It is well also to carefully avoid those things which we find obnoxious in our own experiences as students and not perpetrate them on those who attend our classes.

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MISTAKES OF TRADE INSTRUCTORS

The following material inspired by articles written by Dr. Prosser and C. R. Allen, and by James L. Hughes in the September, 1923, issue of the Vocational Education Magazine, appeared in Series IX of the Service to Vocational Instructors leaflets which are issued at the Kansas State Teachers College, Pittsburg, Kansas.

They are herewith reprinted to help industrial-arts instructors to avoid making them.

1. It is a mistake to think that because a learner can talk intelligently about a job or operation, that he can do the job or operation.

Try him out at the job or operation, under supervision.

2. It is a mistake to take the tools out of the hands of the learner unless as a last resort.

He gains by what *he* does, and *not* by what *you* do for him.

3. It is a mistake to attempt to instruct a man who is not entirely clear on what you have taught him up to that point.

Refresh his mind on the necessary fundamentals before starting new instruction.

4. In giving instruction on an operation it is a mistake to run in a lot of little precautions and tricks as to the operation.

Wait and give these after the learner knows the simple way of doing the job or operation.

5. It is a mistake to demonstrate too much at one time.

Short demonstrations are easily understood, easily remembered, and easily imitated in practice.

6. It is a mistake to assume that telling a learner how to do a thing is the same as showing him how to do it.

7. It is a mistake to assume that telling plus showing equals instruction. This is not a true equation. Telling, plus showing, plus supervision of practice, plus checking up, plus testing, equals instruction.

8. It is a mistake to set such high standards for beginning learners, in the performance of jobs or operations, as to discourage them at the outset.

9. It is a mistake not to realize that the learners must finally reach the commercial standards of the trade.

Shop or instructional standards should aim at commercial standards.

10. It is a mistake to accept from the learner, trade work that does not represent his best effort, even though it may be as good or better than the output of less capable learners.

11. It is a mistake, by injudicious praise, to give a learner the idea that he can do a first-class job before he can.

Keep him deflated to his normal size.

12. It is a mistake to forget that a learner on a new job or operation feels nervous and is easily scared or discouraged.

A word of reassurance once in a while helps to overcome this.

13. It is a mistake to expect all learners to progress at the same rate.

Each has his natural speed differing from the others.

14. It is a mistake to depend upon paper tests as a measure of efficiency in trade processes.

The world will test them out on actual jobs. You should test them by means of practical jobs.

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THE END OF THE SCHOOL YEAR

At this time of the year the jobs which the boys have undertaken in the shop are reaching completion. Some of the boys, being more efficient than others, will naturally finish their work well in advance of the class. The problem how to keep them busy is always troublesome, but why not delegate some of the following jobs to them?

There are tools to be put in condition; the lumber rack probably needs to be enlarged; the shop walls and ceilings could stand a new coat of paint; the bench tops, after the strenuous work of a year, need resurfacing; the supply cabinets and racks could be improved or enlarged; additional shelves for reference books might be required; display racks for illustrative material ought probably to be built; and display boards for illustrative material could probably be made. These boards are always in demand, because the store of illustrative material is constantly increasing. Then, too, the illustrative material itself could probably be mounted by the boys. Of course, this will require close supervision, as will all work which is to be permanently added to the equipment of the shop.

It is surprising, however, how carefully boys will work when they know that it is to be permanently used by future classes. Why not get your boys to lighten your load.

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PRACTICAL EDUCATION

A manufacturing city should offer to its youth an opportunity to fit themselves for the work which the city has for them to do. This would be an advantage to the manufacturer, as well as to the young people seeking employment. Opportunity should be provided for the ambitious and capable youth to become fitted for carrying on the practical affairs of life. It is a fact that the practical side of life cannot be ignored, since the masses must earn their bread.—*R. R. Rogers.*

Summer-Camp Shops

L. E. Smith, Director, Camp Sangamon, Pittsford, Vermont

WHAT better place on earth for a boy to have real fun, than at the shop in a summer camp? Most camps have handwork of some type, but a real honest-to-goodness shop where a boy can go when he wants to, is to him the greatest place in a camp.

We find that on a rainy day, almost every boy in camp wants to work in the shop. Then too, toward the end of the summer when the water begins to be cool, the boys like the warm shop where they can go to make things. Then the long evenings during the latter part of the summer make a fine time for shopwork if the shop is electrically lighted.

The boys are at the camp 24 hours per day. This means that in addition to a regular shop hour with a shop leader present, there are many spare moments when the boys want to work in the shop. The leader, of course, cannot be there at all times, but even so, the shop should be open to let the boys work when they want to. This makes taking care of the shopwork a little more difficult, for it has to be arranged so that it may be done with and without leadership.

On the other hand, this very condition may be looked upon as an opportunity, for it is well known that when a boy wants to work and can work, he will do his best. We have found boys who became so interested in their work, that it was necessary to almost drag them from the shop at mealtimes. There is a great future ahead for leaders or couselors in shopwork who like boys, and who have the capacity for working out a good plan for keeping the boys on worth-while projects both when supervised and when not supervised.

In our present camp shop, we have on hand at all times many mimeographed copies of all sorts of toy animals. The smaller boys in camp can take these, cut them out, and then use the coping saw to finish the job. This kind of work can be carried on, even if the leader is not in the shop. The work is then checked up by the leader at the next regular shop period. It is only after this check-up that the toy-makers are permitted to paint their jobs because no work is allowed to be painted that does not come up to the required standard. For this reason the leader keeps the paints under lock and key. The campers all know that the leader will be in the shop at a given time, and so have their work done to present for inspection at this time.

There are a few things that boys in camp just naturally want to make. These are toy ships and kites. Rather than emphasize toy ships with elaborate plans that would take all summer to build, we let the boys go ahead with their own plans however simple or complex they may be. It usually takes but a short time after the camp opens before there is a small "navy" at the pond. It is lots of fun for the builders to have races between their respective boats.

The kites, too, are great favorites with the boys. Last season at our annual camp election, which is more or less of the "windy soap-box orator" style, a big kite appeared one afternoon flying high in the sky, with a big sign painted on the front, "Vote for Hall." It looked so stately and rode the breeze so steadily that immediately every boy in camp wanted to make a big kite. For real fun for a boy, the flying of a kite can't be beat. We happen to be located on a hilltop and the summer breezes make the kites fly to dizzy heights. We specialize in tailless kites since a camper a year ago used his pajamas as a tail for the big kite which he had made. All went well until his kite string broke and his "nighty" flew to a tall oak tree.

Graphic Arts in the Gary Schools

William O. Wallace, Gary Public Schools, Gary, Indiana

PART I

GARY, Indiana, is famous for two things in particular, its steel mills, and its school system. The plan of school operation as originated here, and subsequently adopted by hundreds of educators throughout the country, is the work of Dr. Wm. A. Wirt. The system is usually called the "W-S-P Plan," being an abbreviated title for the "Work-Study-Play System," not, as one small-town-institute speaker declared, "Wirt's School Plan." The system is also known as the "Platton System."

The outstanding feature of this new departure in school administration is a balanced course of supervised work, study, and play. Supervised play is one of its greatest assets, which, coupled with a well-planned program of trade teaching in the technical-school departments, gives the graduating student two invaluable additions to a thorough academic education —a sound body, and a profitable trade. Twenty trades are taught, two or three of which qualify the students to find employment at the local mills, but for the most part local industries are ignored.

The student's daily program is so arranged that he spends a third of his time at the auditorium, gymnasium, playground, or in the shop classes. These activities are in demand during the full school day. Auditorium subjects, such as public speaking, dramatics, chorus singing, and physical-training programs, constitute a separate and distinct course of study in the Gary schools, under the general head of "Auditorium." All of the supervised play activities, games, and sports, are taught under the general head of "Physical Education," and all of the technical-school occupations and trades are listed as "Shops." These extracurricular activities occupy a third of the enrollment of each school center, while the remaining two thirds is in the academic classes. It is obvious, then, that but two thirds of the usual academic housing facilities are required.

Individual teachers are provided for each subject and each room is thoroughly equipped for the subject taught therein. The system also provides a continuation school, a chain of night schools, and Saturday schools.

It is not the purpose to outline in this article, the working of the W-S-P Plan, except as it applies to the department under consideration, The Department of Graphic Arts.

The term "graphic arts," as used in this article, is used to convey the same meaning it does in the commercial world—printing and all its allied industries. In the Gary schools it includes hand lettering, poster printing, illustrating, designing, simple zinc etching, stereotyping, electrotyping, machine operation and maintenance, linoleum and wood-block cutting, press-work, and proofreading.

Under the W-S-P plan the shop courses are elective, and include in their enrollment, students ranging from 10 to 20 years of age. This is one of the big secrets of the W-S-P system; there are no distinct high schools, each school center embracing all grades from kindergarten to senior year. There are from 1,600 to 2,000 students in each school center, and there are at present nineteen of these educational centers in Gary, with more being built. This intermixing of grades in shops, playgrounds and classrooms, gives the little children a chance to learn by observance and imitation. In the printing classes, a 10- or 12-year-old student from the lower grades may be working side by side with a third- or fourth-year high-school pupil. A condition approaching that of the old-time print-shop, where the "devil" and a two-thirder worked side by side with the journeyman printer.

Any of the old-time printers will attest to the value of the old shop system and all of them acknowledge great indebtedness to some "Muskogee Red," or "Slats Kelly," or "Jungle Kid" of the tourist army of yesteryear, for much of the real craftsmanship learned in those apprenticeship days. In Gary, the good things in the old system that produced the best artisans of whom we boast today, have been left in, and the bad things were taken out, and the system thus refined and refitted, is used in the technical classes.

Another feature of considerable worth in this intermingling of grades and ages, is the automatic elimination of an expensive vocational school. The youngster spends a semester in one shop, and goes elsewhere the following semester if the work has proved unattractive to him. He has plenty of time to try all of the shops before graduation, if he so desires. On the other hand, if he likes the work, he can continue in it throughout his entire school life, and upon graduation he will be well along in his apprenticeship, and able to find work at a substantial salary.

Students selecting printing, or any other subject in the shops as their permanent vocational course, after a preliminary probationary period of one semester, are given apprenticeship certificates showing each semester's accomplishment. These certificates are accepted in the trade and the student's rating as an advanced apprentice is governed accordingly.

Someone has said, and very truthfully, that "the best progress is made by men who adopt the tried and proved short cuts of their predecessors." That particular point is stressed in the Gary technical classes, especially so in the department of graphic arts, where an unusually large number of these "tricks of the trade" have been accumulated, and are taught in connection with the more scientific procedures.

The equipment in all the technical schools of Gary is standardized. This does not mean that a specific make or brand of tool or instrument is demanded, but that size, quality, and design is to be the same in each school shop teaching the same subject. For instance, all drawing boards, all instruments, and all

drawing paper are the same in each of the many mechanical-drawing classes. In the manual-training departments a standardized bench, vise, and tool outfit is required. In the graphic-arts department the size of presses, imposing stones, cabinets, and cases is specified, as is also the weight and style of the type fonts.

A composing-room unit consists of twelve ten-case capacity cabinets, flat top, and desk height, with double case brackets mounted on each. These brackets are placed to the outer edge of the top of the cabinet, so that when cases are not in use, the cabinet top becomes a desk for paper work or study. The cabinets are made considerably deeper than a type case so that when the cases are pushed fully back there is abundant leg room for the pupil. The top slide is occupied by a case-size drawing board, which is designed to be used either in the slide or on the brackets. The remaining nine slides are used for type cases, each containing a 20-lb. font of 8, 10, 12, 14, 18, 24, 30, 36, and 48 point type, all of one series. There is a different series of type in each rack. Lead, slug, and quad cases and cases for additional sizes and styles of type are kept in the full-height cabinets in the alleys.

Four 30 by 40-in. imposing surfaces, a Washington style proof press, and a limited amount of studio equipment, and the usual quota of miscellaneous articles found in a first-class printshop, constitutes the balance of the outfit. In the pressroom there are two 10 by 15-in. and two 12 by 18-in. job presses, and a 42-in. power cutter, and considerable bindery equipment.

The composing room is designed to handle twelve students each hour, and the pressroom four students an hour. Although this is the ideal condition, it must be confessed that more than this number are invariably enrolled; however, with two instructors in a school shop, this excess enrollment is no serious handicap.

The question of production work is one upon which the teachers in graphic-arts courses do not agree. In Gary the printing for the entire school system is done in school shops if it does not interfere with routine lessons. Inasmuch as most of the work required is exactly the kind best fitted for teaching purposes, it gives the student a good chance to familiarize himself with actual commercial work, such as he will be required to do when he leaves school.

Gary schools are operated seven hours a day, from 8:15 to 4:15 with an hour off at noon. This seven-hour system is another advantageous feature of the W-S-P plan, and after several years of thorough trial it has been proved very satisfactory and profitable. This seven-hour school day established a total capacity of 112 students per day in the graphic-arts classrooms.

Students are encouraged to enroll for two- or three-hour periods where possible, although single-hour periods are the rule. Students may enroll in either of the two graphic-arts classes, pressmanship, or typography, but they must transfer to the other course during the school year. No production work is done by any but the most advanced pupils, who are about ready to enter the trade. The value of all production work is fully credited to the shop and is used for the purchase of equipment for the advancement of the student. There is never any difficulty in placing graduates. No student is required to do any production work unless he so desires, and from the number of jobs waiting to be done he may select the kind of work best adapted to complete his trade education.

The new student in the composing room starts with a loose-leaf lesson sheet teaching a simple history of type and showing the various parts of a piece of printer's type. Then follows a short lesson on the point system, a description of spaces and quads and their use, the layout of a type case, the use of leads and slugs, and several lessons on distribution.

In teaching the point system, point-size is the only feature discussed at first, although reference is made to the old three-to-em, four-to-em, five-to-em system of casting spaces. Point-set is taken up in lessons much further along, at which time the set sizes of spaces in points and fractions of points is explained.

(Part II will follow in an early issue of this MAGAZINE)

Wearever Twin Pusher

Geo. A. Phillips, Easthampton, Mass.

(For Fig. 1, see Supplement No. 143)

THE Wearever Twin Pusher was designed from ideas obtained from various sources, and after many experiments by the students of the Easthampton Massachusetts Continuation School. The ideas as set forth in the drawings and manuscript are intended to make the construction of a successful flying model easy for the average boy. When the pusher is not in use it should be kept in a dark, cold room to preserve the rubber motors.

Fuselage. In constructing the pusher it may be well to make the fuselage first. In order to save time and avoid possible mistakes, it is advisable to make a full-size layout on paper and fasten this to a board of the proper size. The longerons, Figure 1, are made of select pine which is strong and easy to work. After sawing the longerons to size, the opposite edges should be channeled, according to dimensions shown on the drawing, to decrease their weight. Note that the channels are not cut into the entire length of the longeron, thus leaving flat surfaces for fastening together the lower points, to form the nose, and for attaching the bearing boxes. Next make the bearing boxes of balsa, and glue them in place at the end of each longeron. Now bend the aluminum (see paragraph on aluminum bearings) around the ends of the longerons as shown in the drawing. Then apply ambroid to the aluminum and bind it in place with No. 40 white cotton thread. Next cut one end of each longeron to a chisel-like taper according to the angle shown on the layout and apply ambroid to the joint. Then clamp the two to-

gether with two pinch clothespins which may be found in almost every home laundry. Now fasten the longerons in place over the layout with fine wire brads, while assembling, so that your work will be true, and then proceed to make the tail wing. (See paragraph on tail wing.)

The tail wing having been made, covered, and doped, should be fastened in place with ambroid. Next cut the fuselage braces, and fasten them in place with ambroid. Now cut out two elevator wedges and fasten them 4 inches from the nose with ambroid. After all the joints have dried hard, the fuselage may be removed from the layout board. The next thing is to round off the fuselage braces to reduce weight. Then fit the nose hook in place, and bind it with thread. (See paragraph on wire fittings.) The whole fuselage may now be sanded with No. 00 sandpaper, and given a coat of shellac. After the shellac is dry it should be sanded again. The whole is then lacquered any desired color. The thread bindings may be lacquered another color for decoration. The last operation is that of drilling a 1/16-in. hole through the aluminum and each bearing box to act as bearings for the propeller shafts. No "cans" are used on this fuselage frame.

the same points with a curve such as is shown in Figures 1 and 2. Describe a ½-in. circle to form the hub. You have now completed operations 1 and 6, Figure 2. The blocks may now be sawed on the band saw, having been fastened together with fine brads. Be careful that the brads are placed outside the design, so that they are away from the lines where the saw is to cut. The blocks are then separated, and appear as shown at 2 and 7, Figure 2. The blades are then carved with a sharp knife, cutting from the upper edge to the opposite lower edge, curving the blade as shown, at 3 and 8, Figure 2. The curved edge of the propeller is chosen for the entering edge. Next carve the same side of the opposite blade, and sandpaper the curves smooth. See 4 and 9, Figure 2. Insert a piece of piano wire through the center hole and balance the blades evenly by cutting or sanding weight off the heavy blade. The other sides may now be carved, and as the propeller blade nears completion, be careful not to cut through. The blades should be slightly less than 1/16 in. thick at the ends and gradually increase in thickness to the hub, as shown at 5 and 10, Figure 2. They should again be balanced and sanded and the hub cut down as much as possible to reduce the weight. The

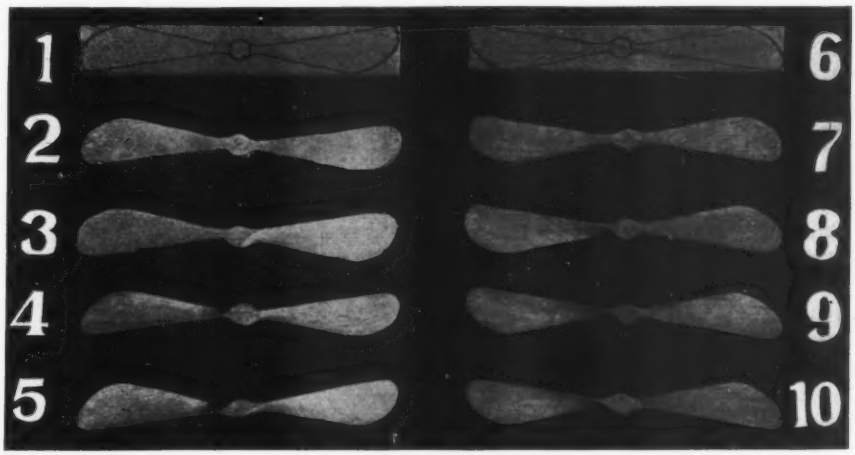

FIG. 2. PROPELLER CARVING

Propellers. The design and the workmanship in making the propellers are very important, for upon them hinges the success or failure of the twin pusher's performance. The correct combination of propellers and models is largely a matter of trial. Their diameter may be from one third to one fifth the length of the main wing. To construct the propellers, cut two rectangular blocks of white pine according to the sizes given in Figure 1. Draw across the corners on the surface of one block. The point where these diagonal lines intersect will be the center at which point a 1/16-in. hole will be drilled perpendicular to the surface. Before drilling, fasten one block on top of the other in order to drill both blocks at one time. Next, with your compass points set ½ in. apart, describe an arc in the upper right- and lower left-hand corners of the top block. With a straight line connect the points where the arcs are tangent with the sides. Now measure 1½ in. down on the top left- and the bottom right-hand edges and connect these points with a line forming the widest part of the propeller. Then connect

twin pusher requires both right- and left-hand propellers, so the blades of the block should be cut opposite as shown in Figure 2. The propellers may now be shellacked, sanded, and lacquered the same color as that applied to the fuselage thread binding.

Tail Wing. Before constructing the tail wing, a full-size layout should be drawn on paper. Next select a piece of ¼ by 3 by 3-in. balsa. Next, cut three grooves with a narrow-gauge circular saw as shown in the section of the tail wing, in Figure 3. Then form the curve or entering wedge by using coarse and then fine sandpaper. This piece of balsa may now be cut into ribs approximately 1/16-in. thickness. No dope need be applied to the ribs. Next, cut three spars to fit the grooves, and then attach the wing ribs thereon with ambroid, according to your layout. Be sure that the outside ribs, which should be twice as thick as those used on the inside, are set a. the exact angle of the "V" in the fuselage. The bottom of the wing frame should then be covered with china silk, drawing it as tightly as possible. Then cover the top.

(See directions for covering in the paragraph on the main wing.) When the glue is dry, the tail wing is ready to be ambroided in place on the fuselage.

Main Wing. A full-size layout should be drawn of this wing frame to show the sizes of the spars and ribs. The ribs may be cut and formed out of balsa as outlined in the description of the tail wing. The spars for the large wing should be made of white pine to assure strength. The ribs are fastened in place as before.

This model flies best with straight wings, but if the builder wishes to have a dihedral (upward bend) in the main and elevator wings a layout should be made of each half. To form the dihedral, a slight bevel is cut on the inside surface of the two center ribs which are ¼ in. thick as are also the two outside ribs. When the ribs are in place and the ambroid is quite hard, the center ribs may be ambroided together, thus forming the dihedral. The bevel on the center ribs should be cut at such an angle that the ends of the spars will be 1 in. higher than the center ribs.

In covering the wing frames, separate pieces of silk should be cut for the top and bottom sides of each frame allowing about 1 in. extra on all sides. Glue the covering for the bottom to one end of the wing using a limited quantity of glue. When it has dried, glue the covering to the other end, drawing the silk tightly to give a smooth surface. Do not glue it to the intermediate ribs. Both edges may be glued at the same time when the ends are dry. Now cut off the surplus silk and rub the edges neatly to the frame with your fingers which have been dipped in very thin glue.

The top is covered in the same manner. After the wing has set two hours, it may be sprayed with water. This will shrink the silk. It may then be doped. In covering a wing having dihedral, the silk should be glued to the center ribs first and allowed to dry, then glued to the outside ribs.

Paper is not recommended for covering the wings of the "Wearever Twin Pusher."

Elevator Wing. This wing is constructed and covered in a similar manner as the tail wing and main wing. It may also be made with a slight dihedral if desired.

Winder Hooks. The winder hooks are fittings made of No. 14 piano wire and used for attaching the rubber motors to the fuselage at the nose hook, and also to the special winder when the motors are to be wound.

A short piece of "Acme" No. 14 spaghetti is slipped over the winder hooks to prevent the fine wire from cutting the rubber bands. This spaghetti may be procured at almost any electrical store handling radio supplies. See "Bending Operations for Wire Fittings."

Nose Hooks. The nose hook holds the rubber motor and winder hooks to the fuselage. This is also made of No. 14 piano wire and is fastened to the nose of the fuselage with ambroid and then bound with cotton thread.

Propeller Shafts. The propeller shafts are made of No. 14 piano wire and covered with spaghetti as shown in Figure 4. The ends may easily be formed by bending the wire around a piece of ⅜-in. dowel rod. A small hook is made on the end to keep the tension, caused by winding the rubber motors, from opening the "eyes" of the shafts.

Copper Washers. These washers are cut ¼ in. in diameter, and a 1/16-in. hole is drilled in the center. They are placed on the propeller shafts, between the bearing boxes and the propeller hub, to reduce friction. They should be well oiled before each flight. See "Propeller End Assembly."

Aluminum Bearings. These are formed by bending a strip of No. 34 gauge sheet aluminum, ⅜ in. in width, around the bearing boxes. The aluminum should be ambroided and bound in place with thread.

Rubber Motors. The rubber for each propeller motor consists of 20 strands of ⅛ by 30-in. flat gray rubber. The motor is attached to the propeller shafts and winder hooks.

After the rubber motors have been placed on the shaft and winder hooks, the strands should be tied together with short pieces of rubber thread to hold the strands together. Each motor takes approximately 60 ft. of rubber thread.

A few drops of glycerin should be applied to the rubber motors before the model is flown.

Assembling, Balancing, and Launching Twin Pusher.

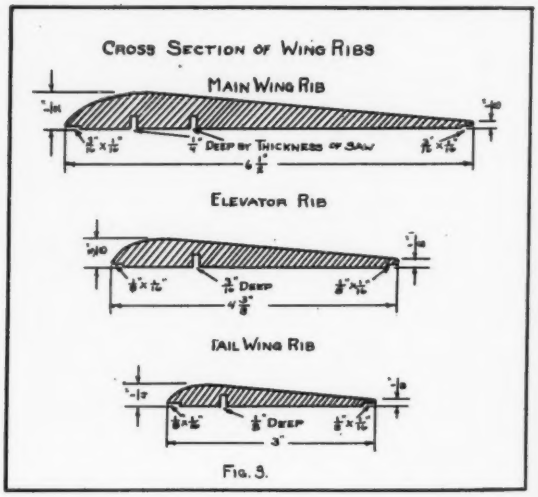

Fig. 3.

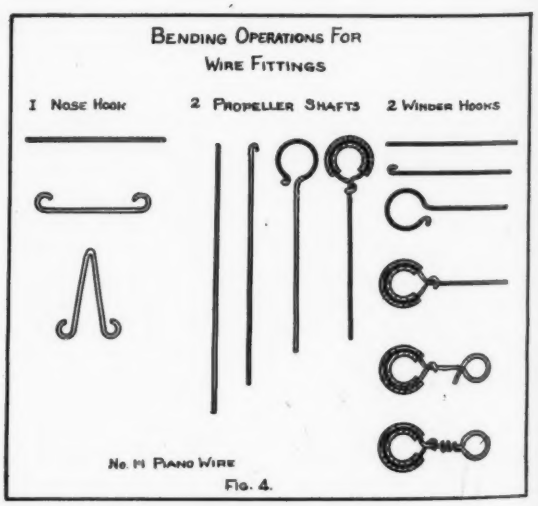

Fig. 4.

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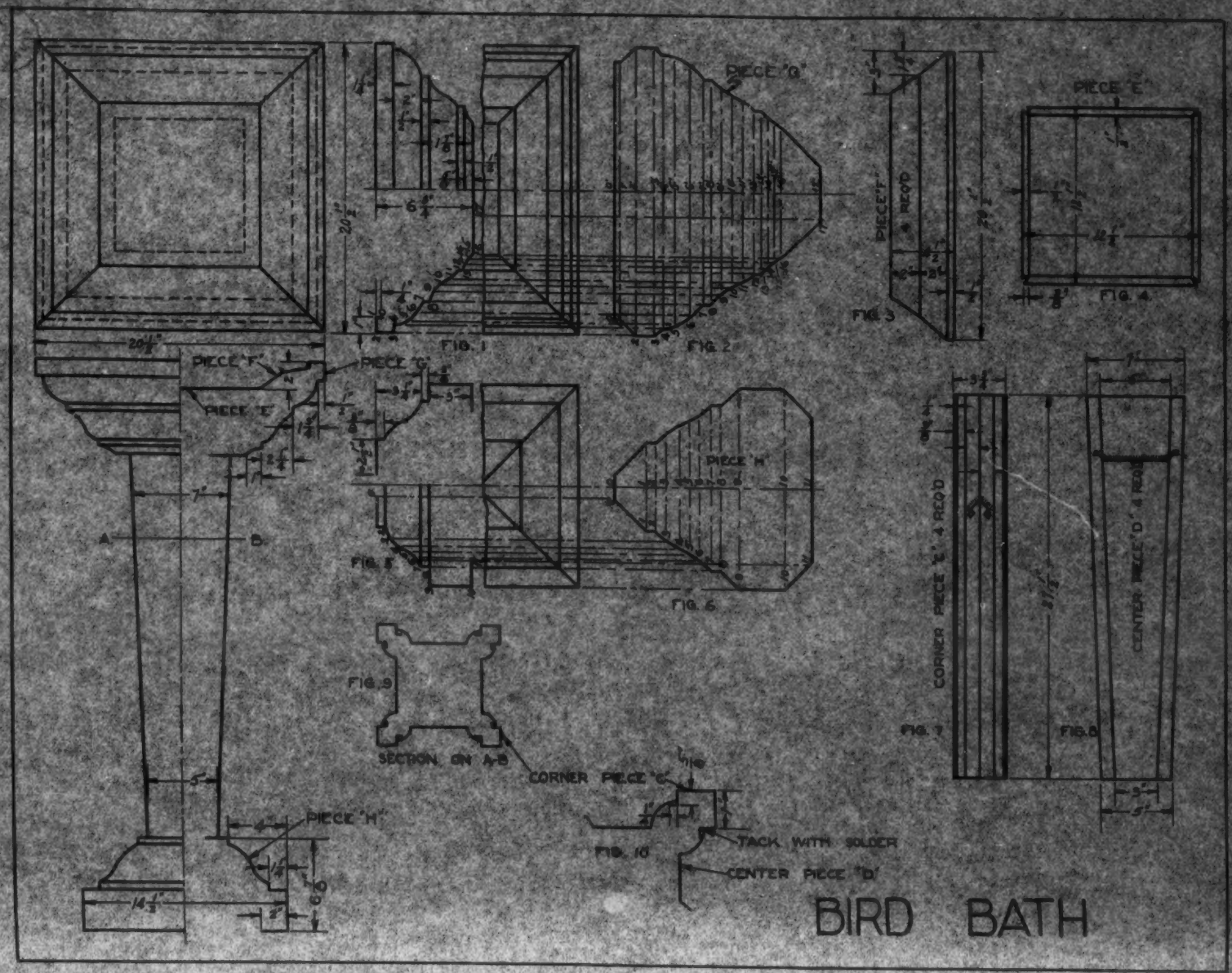

Designed by Harry W. Kroll, Buhl, Minn.

FIG. 1

For Description See Page 366, Industrial-Arts Magazine, July, 1929.

TRACING SUPPLEMENT No. 143

Designed by Harry W. Krell, Buhl, Minn. FIG. 1 For Description See Page 260, Industrial-Arts Magazine, July, 1929.

TRACING SUPPLEMENT No. 143
THE INDUSTRIAL-ARTS MAGAZINE,
JULY, 1929.

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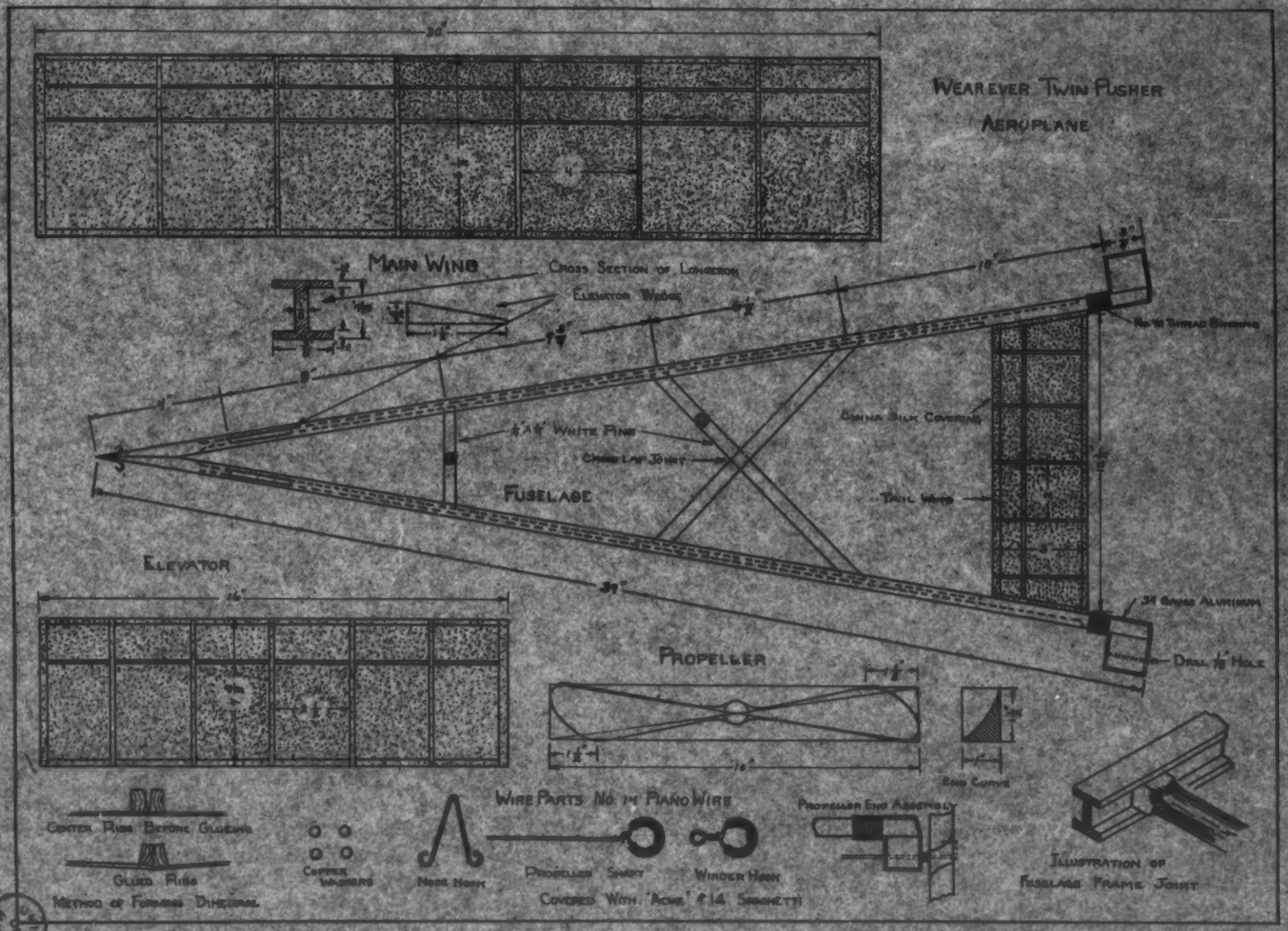


Designed by Geo. A. Phillips, Easthampton, Mass. FIG. 1 For Description See Page 262, Industrial-Arts Magazine, July, 1929.

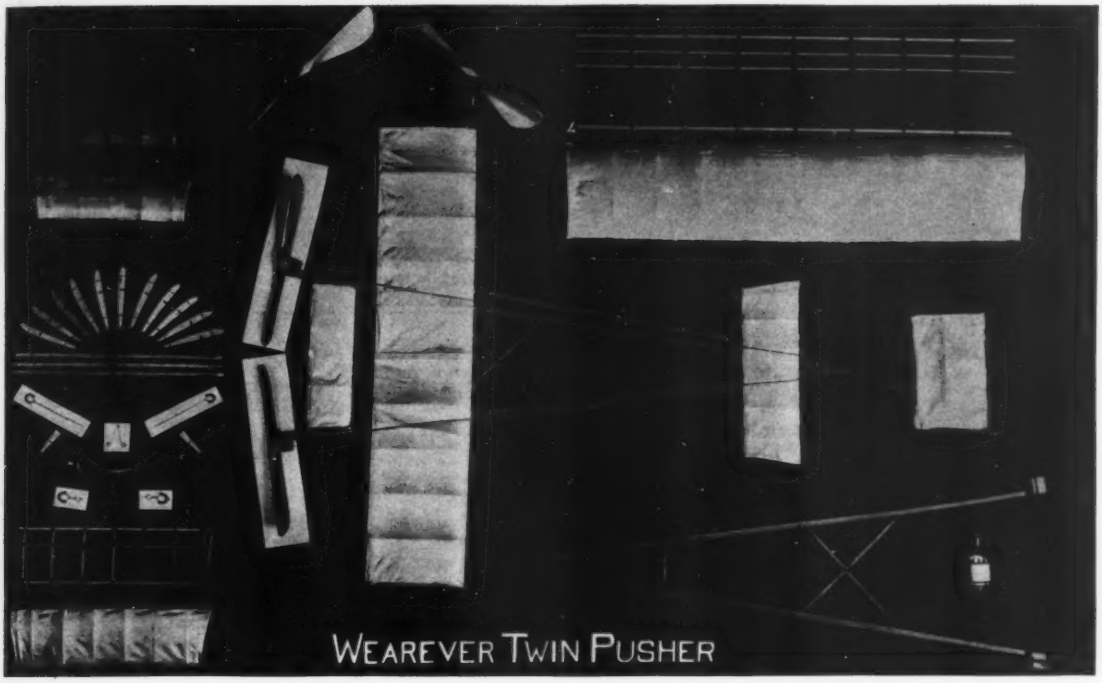


FIG. 5. THE PARTS AND THE ASSEMBLED AIRPLANE

1. Dampen the rubber motors with two or three drops of glycerin.

2. Fasten the main wing to the frame with two 3-in. elastic bands, passing each band under a longeron and taking the two loops on each side of the longeron and opening them on top and passing the main wing through, after which the bands will hold it in place. The elevator is similarly held in place.

3. Glide the pusher several times to see that it is properly balanced, moving the wings back to correct for tail heaviness, and forward to make the pusher hold its nose up. In other words, if it noses down, move the main plane or wing forward; if it noses up, move the wing slightly backward until the model makes a nice even glide; then it is ready for flight.

4. Select a large clear field for the flight, and wind the propellers with the winder in the direction opposite to that which is necessary to blow the air away from the model. It is necessary to have a partner hold the propellers and the frame while it is being wound. Before winding, stretch the rubber about three times its normal length, and as you wind approach the model so as to arrive with the winder at the model when the strands are fully twisted. Unhook the winder and attach the rubbers to the model.

5. To launch, face the wind; hold the model above the head and well back; point the nose up slightly and thrust forward. If flying conditions are right and the model is properly balanced, a flight of over 1,000 feet may be expected.

CHECK LIST FOR SHOP DEMONSTRATIONS

H. John Paustian, Walnut Junior High School, Grand Island, Nebraska

THIS check list is based on the suggestions on demonstrations contained in "Content and Method of the Industrial Arts" by Vaughn and Mays, published by the Century Co., New York.

1. *All* tools and *all* materials must be in readiness on the demonstration bench at the beginning of the period.
   - *a*) Forgotten material dissipates the effectiveness of the demonstration.
   - *b*) Forgotten or unsharpened tools will make such mistakes seem legitimate when the boys do the same job.
2. The demonstration should come at a time when most of the boys are ready for it.
   - *a*) The slowest ones must be given a second demonstration.
   - *b*) The better students should not be held up because of slow ones.
3. The demonstration should present a single fact or tool operation.
   - *a*) A number of details will tend to cloud the effectiveness of any one fact.
   - *b*) One thing at a time is sufficient.
4. The teacher must be a skilled workman.
   - *a*) The demonstration must be well done.
   - *b*) Boys will appreciate skill.
   - *c*) Good craftsmanship motivates the work.
5. The demonstration must be short.
   - *a*) More than fifteen minutes not required.
6. The demonstration must be accurately explained as it progresses.
   - *a*) Good statements from the teacher will help to clarify the operations.
   - *b*) Questions from the boys should be forthcoming.
7. Only material closely related to the demonstration may be introduced.
   - *a*) Attention must not be taken from the job at hand.
   - *b*) Attention of the boys should tend toward concentration.

PROBLEMS AND PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in woodworking, turning, patternmaking, machine-shop practice, sheet-metal work, forging, foundry work, auto mechanics, auto electricity, electricity, architectural and mechanical drafting, printing, bookbinding, concrete work, farm mechanics, home mechanics, and other lines of industrial-arts work are desired for consideration.

A BIRD BATH

Harry W. Kroll, Buhl, Minnesota

(See Supplement No. 142)

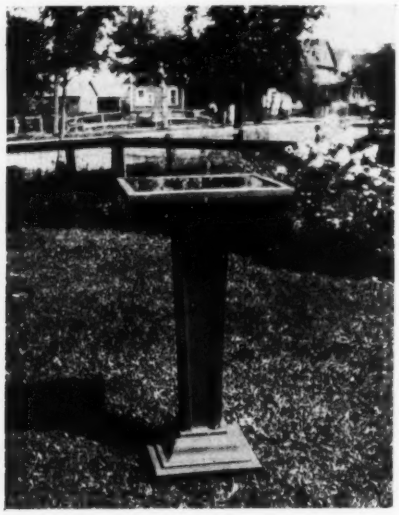
The possibility of constructing garden furniture from material other than the established rock type is shown in the accompanying drawing and picture.

As a problem for an advanced sheet-metal class, the bird bath described herewith, serves very well. It is excellent for sheet-metal drafting in cornice work, bending on the cornice brake, and soldering miter joints. It is possible, with a little ingenuity, to construct this piece with ordinary tools in the average workshop. By using pipes of various sizes, blocks of wood, and a good vise, a first-class job may be done.

No. 26 gauge galvanized iron is used throughout.

Draw out all parts of the bird bath full size on drawing paper.

1. Lay out a drawing of the top as shown in Figure 1. Number all the corners, and divide the curved portions into any number of equal divisions. Commencing at O, measure



the distance from O to I and transfer it to piece G, Figure 2, as given distance O′ to I′ on line O′–17′. Continue taking the distance from 1–2, 2–3, 3–4, etc., and transfer to center line O′–17′ until the complete distances have been taken. Now project each point from Figure 1 down to piece G to the line having the corresponding number, i.e., point 2 is projected down to point 2′ on G. Piece G is the pattern of one side laid out flat before forming, therefore, distance O′ to 17′ on G must be equal to the distance from point O to 17 on Figure 1. Four pieces of this pattern are required for the top.

2. Lay out and draw the pattern for the base as shown in Figure 2, in the same manner as that used for laying out the top, thereby constructing pattern H, Figure 6. Cut out four pieces for the base.

3. Lay out and cut four pieces F, Figure 3, according to dimensions.

4. Piece E, Figure 4, is required for the top, according to the dimensions given.

5. Four center pieces D for the upright post are required as shown in Figure 8.

6. The corner pieces C, Figure 7, four in number, are cut next.

7. In bending the piece G for the top, secure a narrow strip about two inches wide and bend to fit the shape designed. In this manner the inexperienced craftsman will become familiar with the design and order in which the bending is done. Now proceed to bend piece F, Figure 3, to conform somewhat closely to the design in the drawing.

The center pieces D, Figure 8, are bent to the proper shape as shown, to conform also to design on "Section on A-B," Figure 9. Complete corner pieces C, Figure 7, in the same manner to conform to the design in Figure 10.

The base pieces H are bent to shape in a manner similar to the top pieces G.

8. Having all pieces bent, proceed to prepare for soldering. Use cut acid for flux. This is prepared by pouring muriatic acid in a glass or stone vessel and adding zinc scrap until the reaction ceases.

Lay out the four top pieces G and tack the four corners on the outside with solder. Use a steel square to test the corners and tack all joints temporarily until the miter joints are true and the entire piece is square. Now proceed to solder on the inside of the miter joints. Remove all surplus solder on the outside of the miter joints with an old file.

Proceed to solder the base pieces H in a similar manner.

Now tack on, temporarily, pieces F, bending them if neccessary to fit at the miter joints. Lay in piece E and solder in place to conform to the design as shown in cross section in the front view of the drawing.

Tack together the pieces for the post until the proper fit is secured, then solder all joints permanently.

Locate the position of the post by drawing lines on the top side of the base and the underside of the top. Tack it in place and sight from all sides to see that the base and top are lined up true.

9. The finish which harmonizes best with outdoor surroundings is light brown or tan. Rub the surface well with steel wool and expose it to the weather for a few days before applying the finish, which may be paint, enamel, or lacquer. The top, which contains the water, should be covered with sand as soon as the finish has been applied. This will give a surface similar to stone, and is abrasive enough to give the birds a better chance for stopping in flight. After sanding the upper surface of the top, brush off the dust and sand that may have accumulated on the other surfaces, and complete the finishing. The entire piece may be sanded if this type of finish is preferred.

Before setting out the bird bath, turn it over and fill the base with sand or rock and cover the opening with a piece of metal or board. This will give the proper stability to the piece.

One will realize the value of the bird bath when it has been placed in the garden, surrounded by flowers, shrubs, and trees, all that nature brings to us in the summer season.

THE OXYACETYLENE TORCH IN HARDENING AND TEMPERING

J. W. Bowen, Instructor of Machine Shop, Independence High School, Independence, Kansas

Time and trouble can be saved by using the oxyacetylene torch for hardening and tempering. One of the exasperations of a machine-shop teacher is the hardening and tempering of tools, a few at a time, as made in the usual way. The small

gas furnace takes from 25 to 30 minutes before it is at the proper temperature. With the oxyacetylene torch it is quite different.

A 2-lb. double-face hammer head was brought to cherry red in just 3¼ minutes from the time the torch was lighted. A size A65 Smith tip was used. The two faces were cherry red while the rest of the hammer head still showed black. After quenching, the metal required almost no cleaning because a neutral flame with no excess oxygen was used.

When using a furnace or forge fire it is difficult to control the degrees of heat in the different parts of the tool to be hardened. When using the torch it can be so played upon the various surfaces as to give almost absolute control.

In the hardening of knives, the torch with small tip is moved in a crescent-shaped path. The reversal of direction takes place after passing off from the back edge of the knife.

The hammer head which was heated in 3¼ minutes was out in the open, lying on a fire brick. An open box or corner of fire-brick is a gas saver as tools heat more quickly by lying in such a box.

We have used the oxyacetylene method for the past two years on hammers, hatchets, screw drivers, cold chisels, punches, and on butcher knives. It has been found to be successful in every instance.

CAMPING AND TOURING ICE BOX

I. F. Mueller, Council Bluffs, Iowa

The ice box described herewith is designed to be fastened to the running board of an automobile. The box holds 25 pounds of ice. The ice is placed in the bottom of the box and the food is packed on top. On extremely hot days it may be necessary to buy ice daily. In warm weather it usually lasts for about two days. In cooler weather it, of course, lasts for a longer period of time.

The box is not difficult to make. After the front, back, and sides are assembled, fit in the bottom board and fasten it with screws. Then have a box made of galvanized iron. Fit it into the box, leaving about a ¾-in. space at the bottom and sides for sawdust. Tack the galvanized iron box into the wooden box at the top, and turn the whole upside down. Remove the bottom board of the box and fill the space between the galvanized box and the wooden box with sawdust. Tamp this down lightly, then cover the bottom of the metal box with sawdust and fasten the bottom board in securely. The inside of the cover must also be lined with galvanized iron and filled with sawdust in the same manner as the box was.

The outside corners of the box may be reenforced with tin. This not only strengthens the box but also improves its appearance. The sides of the box are made of ¼-in. pine which was painted twice with linseed oil on the inside before the galvanized iron box was put in place. The two bottom cleats shown in the illustration are made of hardwood because they must hold the heads of the bolts by which the box is fastened to the running board. These cleats are screwed to the bottom board. The outside of the box was given two coats of black paint, two coats of marine paint, and finally two coats of valspar, in order to resist the weather.

Bill of Material

White Pine:
- 20 ft. ¾ x ¾
- 4 ft. ¾ x 1¼
- 1 ft. ¾ x 20
- 12 ft. ½ x ½
- 2 ft. ¾ x 3
- 16 ft. ¾ x 10

Hardwood:
- 2 pc. ¾ x 1½ x 12

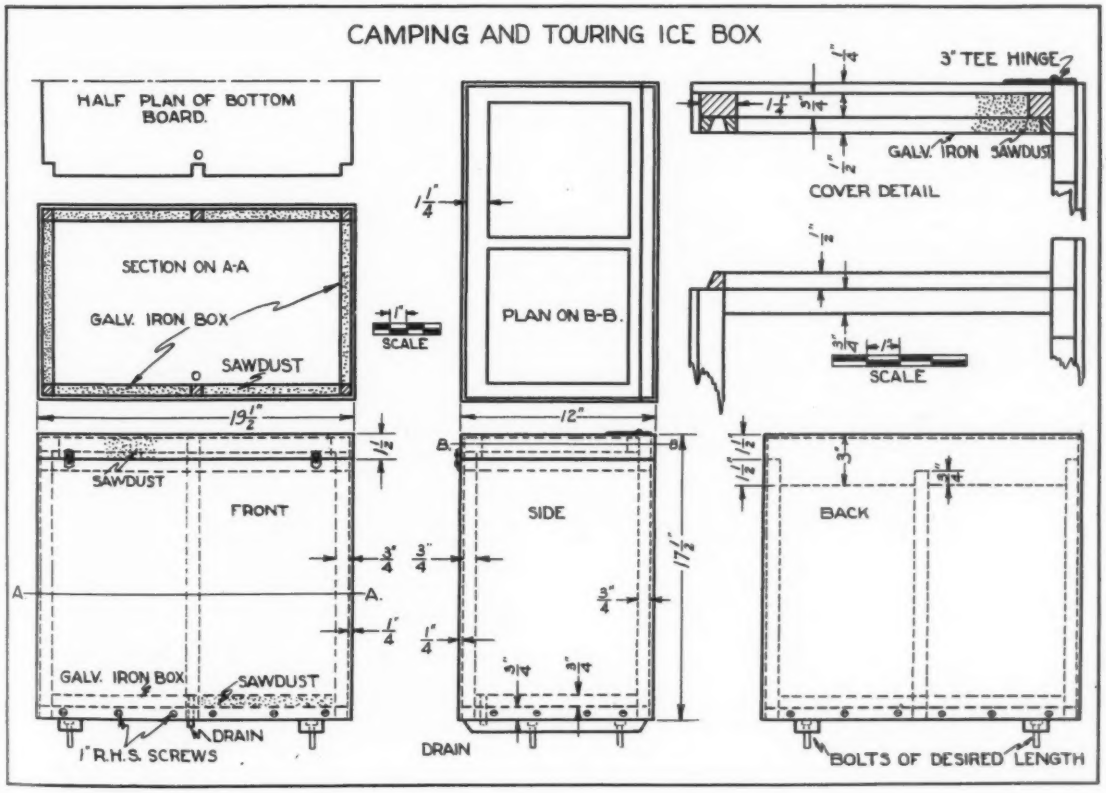
Hardware:
- 1 pair 3-in. T hinges
- 2 box catches
- 20 1-in. No. 10 r.h.b. screws
- 8 1½-in. No. 10 f.h.b. screws
- 2 or 4 ⅜-in. machine bolts—length as required.

A PIANO LAMP

Frank P. Wentzel, Kingston, Pa.

The piano lamp shown herewith is very useful for use on an upright piano. It is made entirely of wood, and therefore may be given the same finish as the piano itself.

The fastening arm of the lamp is extended over the top of the piano, and is securely held in place with a tin or copper



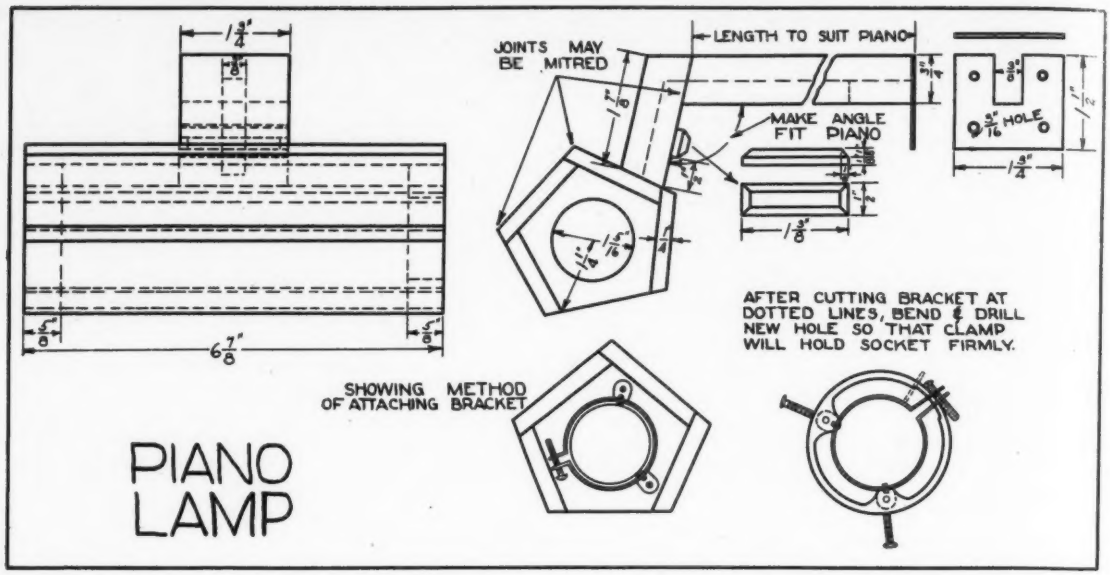

JOINTS MAY BE MITRED
LENGTH TO SUIT PIANO
MAKE ANGLE FIT PIANO
5/16 HOLE
AFTER CUTTING BRACKET AT DOTTED LINES, BEND & DRILL NEW HOLE SO THAT CLAMP WILL HOLD SOCKET FIRMLY.
SHOWING METHOD OF ATTACHING BRACKET
PIANO LAMP

plate screwed to the back of the piano. The instrument, therefore, is not marred in any way.

The socket may be either of the key or pull chain type and is fastened in place with screws in the bracket, which is cut down as shown in the illustration.

The electric cord from the socket is hidden in the groove which runs through the fastening arm.

The inside of the frame may be given a coat of silvering to improve its reflecting power.

MIXING SPOON

C. Anthony Van Kammen, Grand Rapids, Michigan

Very often interest may be created in a turning exercise if a problem is chosen which serves a useful purpose when it is completed. Mixing spoons can be purchased in ten cent stores and variety stores for next to nothing, yet it is surprising to see what a difference it makes to the boy whether he is turning a square of wood into just a skew or gouge exercise or whether he is turning up a similar piece of wood into a pair of finished spoons that may be taken home for use.

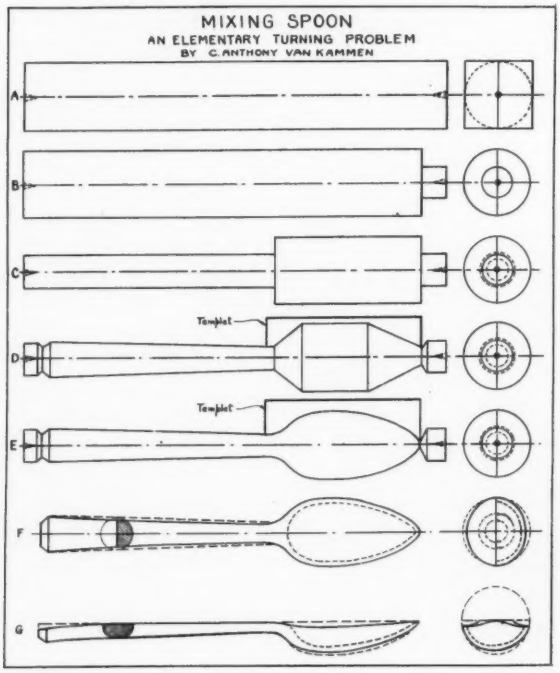


FIG. 1

The work involves many experiences. Pieces of wood must be cut to size and jointed for gluing. A special joint is made by using tough paper so that the pieces of wood may be split apart after turning. The finished turnings must be partly shaped by hand with a spoke shave. It must be filed and sandpapered, and the bowl of the spoon must be carved out by means of gouges and also finished with sandpaper. A boiled-oil finish completes the job.

Cut two pieces of wood to size. Two strips of heavy drawing paper are cut to the same size as the faces of these pieces. Glue is spread on one face of each of the pieces of wood, and a strip of the paper is then laid on each of the glued surfaces. Next, glue is spread over one of the paper surfaces and the pieces are carefully clamped with hand screws. See that the jaws of the hand screws are parallel. Place the hand screws on the wood from both sides of the piece. This insures a more even pressure.

When the glue has had time to dry, square up the ends of the piece. Locate, and bore gimlet holes for the lathe centers. The holes are bored so that the spurs on the lathe centers will not act as a wedge and open up the glue joint which splits rather easily on the paper seam. (See Fig. 1-A.)

The student may now proceed with the turning exercise. As each step is completed the instructor should check the work and enter credit when the work is satisfactory. A cylinder should be turned the exact size of the greatest diameter of the

FIG. 2

spoon. (See Fig. 1-B.) This should be calipered by the instructor. Next, the handle end is turned to a smaller cylinder the size of the greatest handle diameter. (See Fig. 1-C.) Again the instructor is called to check the work. Step three is a problem in taper cutting with the skew chisel. This work, when completed, should be tested with a template. (See Fig. 1-D.) The fourth step in turning the spoon is a gouge exercise. The spoon is now turned to finished size and before it is sanded it should again be tested with a template by the instructor. (See Fig. 1-E.)

After the turning has been completed, the sides of the handle are spoke-shaved and filed to shape. The outside of the bowl is also filed down as shown at Figure 1-F. The turning is now carefully split on the paper parting. Clamp a half section on the bench, flat side up, and carve out the bowl. A piece of wood of proper thickness, grooved to permit the handle to rest in it, holds the spoon stock more securely while the bowl is being carved. (See Figure 2.) Sand the bowl and handle carefully and finish with hot boiled linseed oil.

REPAIRING A METAL ROOF

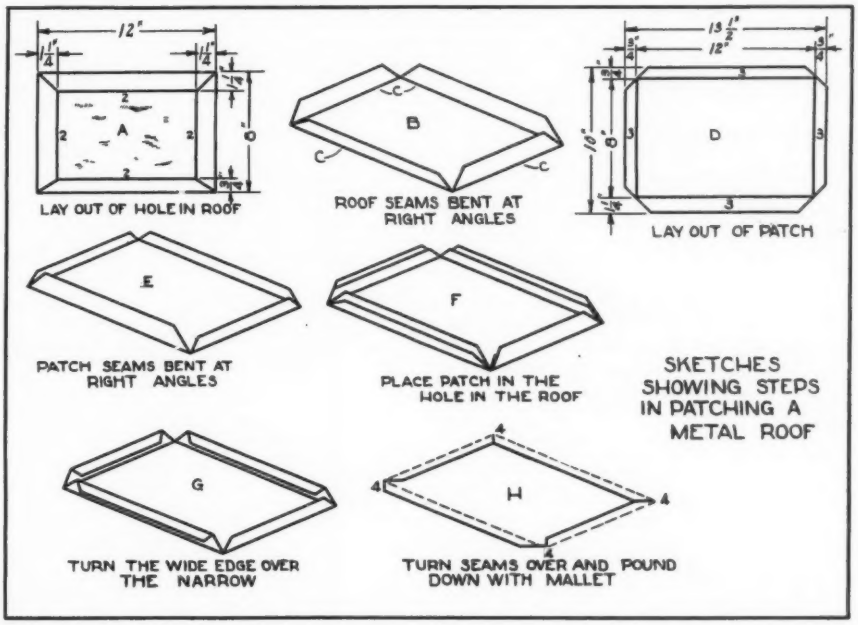
Chas. A. King, East Kingston, N. H.

There are excellent reasons why so many utility buildings upon farms and around manufacturing plants are covered with some form of metal roofing instead of with the convenient asphalt and asbestos roofings. Metal roofings laid upon suitable roof-covering boards give good service if kept well painted, but the flaking, blistering, or scratching of roofing paint invites rust which never refuses to respond. Every metal used for roofing, except copper, lead, and zinc, which are rarely used, is subject to rust, and no coating has yet been discovered which cannot be scratched and which will certainly and permanently resist rust.

By the time a metal roof has reached the leaking stage, it may have been more or less efficiently painted several times very likely without having the scale or blisters removed before the new coat of paint was applied. Exposure to the elements has made the roof appear so badly rusted and weak that it will be condemned offhand and plans made for laying a new roof.

It is well though, to inspect such a roof carefully, for often this expense and inconvenience may be avoided and the roof given a new lease of life by judicious repairing which may not cost more than a fifth of the expense of a new roof. First let us find the exact condition of the old roof before we condemn it. Sweep the entire roof carefully, especially in the corners, around the flashings and along the edges of the standing seams and wherever it looks as though it might leak around a malleted flat seam. With a wire brush, remove all scale and rust to the bright metal. If we find there is still metal left we are in luck, for a thick puttylike roofing cement spread on with a putty knife or trowel will make these places safe again. Even if small holes, not larger than a pencil lead are found, the same treatment will suffice, but if there is a group of such holes, within an area as large as the hand and surrounded with good metal, a patch of asphalt roofing or of canvas may be cemented tightly over them and well doped with cement or paint.

If the holes through the metal are of the nature of breaks, test the metal around them including whatever weak places may be near and make a patch large enough to cover them all. Let us say that a patch 8 by 12 in. will allow a group of breaks and holes to be cut out as at A, and allow enough for the seams. Draw pencil lines around the bad place A for the patch and seams as at 2, the latter to be turner up at right angles as at B, making a square corner at C. Lay out and cut patch D from a perfect piece of metal, perhaps 1/16 in. less in the 8 by 12-in. over-all dimensions, allowing for seams as at 3, and bend the latter up as at E. Place the patch inside the space as at F, turn the 1¼-in. edges over the ¾-in. edges as at G, and pound them down with a mallet as at H. The corners at 4 should be soldered if possible, but they may also be puttied over with roofing cement and they will then give very little trouble.



Use a good asphalt roofing paint to cover the patch. Do not use coal-tar preparations which crack in cold weather. Apply the paint with a 4¼-in. or smaller brush, brushing out well and working the paint into all seams and places where water might find entrance. A long-handled brush or a larger brush will not give as good results, for rather intensive work is required. Such a roof could be improved still more if it were given a troweled coating of roofing cement instead of paint, for then it would be practically as good as a new roof and cost much less. In any case, vigilance is the price of a permanent metal roof, for it should be inspected each year and weak places treated with cement or by patching.

TYPICAL JOB SHEET FOR THE AUTO SHOP

Ray F. Kuns, Cincinnati, Ohio

Removing the Ford Model T Power Plant for a Complete Overhauling

When the Ford engine and transmission are to be overhauled, it is necessary to remove the engine from the car frame.

1. Drain the water and remove the hood and radiator.
2. Drain the oil.
3. After having positioned the car, disconnect all of the electric wires which would interfere with lifting the motor.
4. Remove the spark plugs.

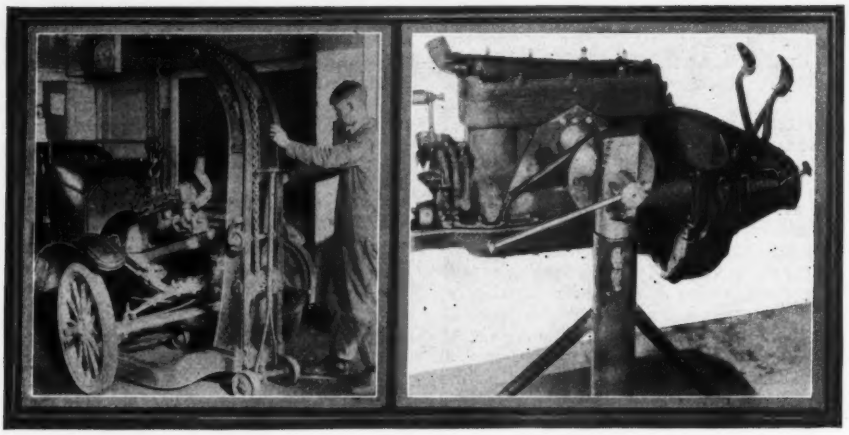


FIG. 1

FIG. 2

5. Shut off the gasoline at the tank, and disconnect the supply pipe from the carburetor.
6. Remove the carburetor controls.
7. Remove the engine pan and the hood blocks.
8. Disconnect and remove the steering gear, mat, and floor boards.
9. Disconnect the exhaust pipe and withdraw the universal ball cap bolts.
10. Remove the radius-rod ball cap, and drop the radius-rod ball end.
11. Remove the crankcase arm bolts and the front-end mounting cap, using the chain fall or crane (Fig. 1) to lift the engine from the frame and mount it on an engine stand, as suggested in Figure 2.

Note: These engine stands may be had in a number of designs. The well-designed stand will permit all overhauling operations to be performed without interfering with the stand.

A ROPE TWISTER

Harry L. Cotter, East High School, Erie, Pa.

The action of Commander Byrd in allowing the American organization of Boy Scouts to name one of their members to his party of Antarctic explorers has done more to arouse interest in scouting than any other incident since the great war. Consequently, the name of Paul Siple, the lucky scout, is a name of great prestige among his fellow scouts, and it is because of this prestige, that we believe the instrument shown in the drawings accompanying this article will be of great interest to industrial-arts teachers.

Among the many other things Siple had to learn to do before qualifying for his honor was the art of ropemaking. Of course, some scouts do this by hand, but they are not so successful as those who use a simple machine such as the one shown here; and this one is the machine designed and made in the East High School machine shops for use in Siple's own scout headquarters at Erie, Pa.

This project, the details of which are shown in Figure 1, can be recommended very highly, both to machine-shop instructors and teachers of advanced mechanical drawing, not only because of its almost certain appeal to the interest of the boys, but also because of the great variety of designs possible. For example, the gear ratio and center distances may be changed for problem assortment; then the method of fastening the gears to studs may be any one of several different constructions; viz., press fit as shown, keyed fit for either Woodruff or square key, threads and jamb nuts, etc. The assembled machine is shown in Figure 2.

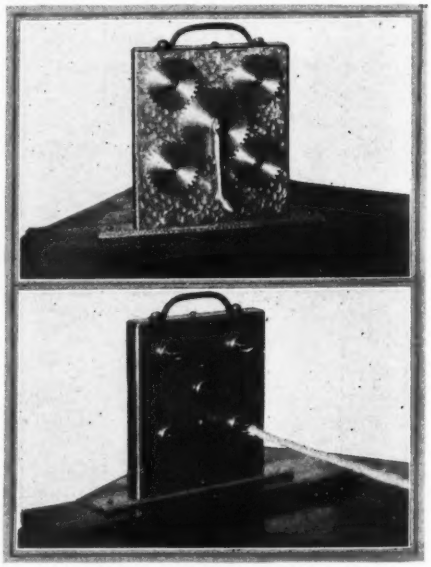


FIG. 4

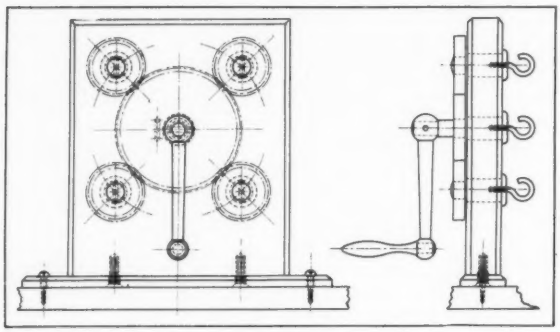


FIG. 2

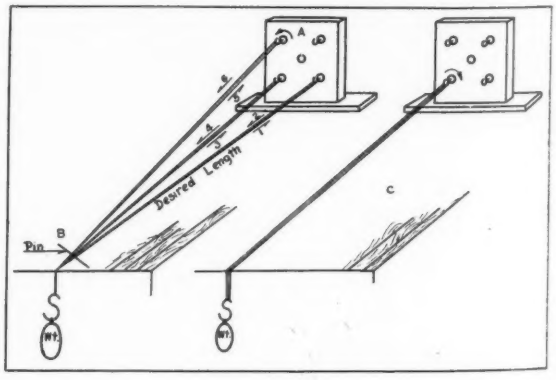


FIG. 3

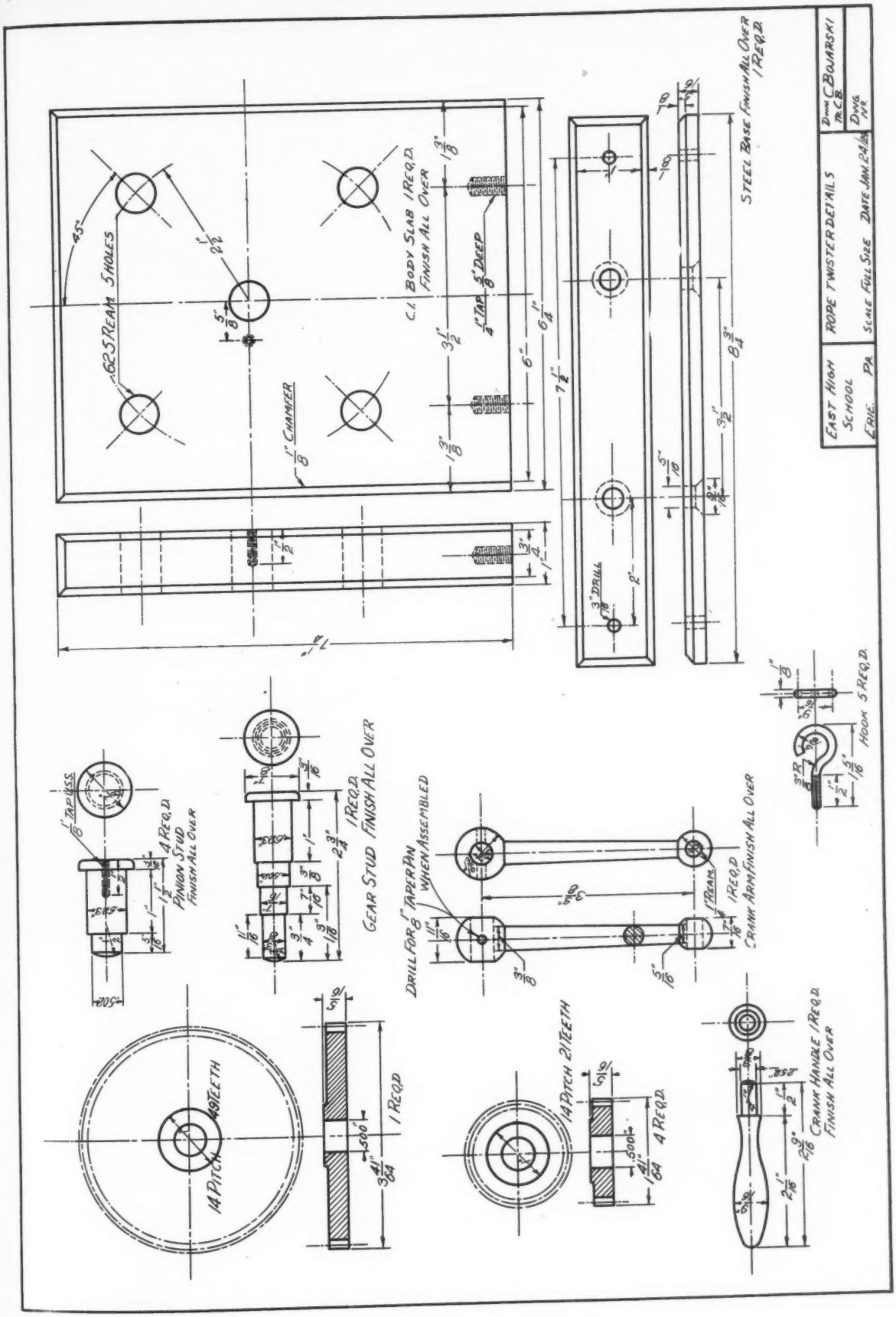

EAST HIGH SCHOOL ERIE PA
ROPE TWISTER DETAILS
SCALE FULL SIZE DATE JAN 24/29
Drawn C. BOJARSKI
Traced
Drawing No
4 REQ'D PINION STUD FINISH ALL OVER
1 REQ'D GEAR STUD FINISH ALL OVER
DRILL FOR 1/8" TAPER PIN WHEN ASSEMBLED
1 REQ'D CRANK ARM FINISH ALL OVER
HOOK 5 REQ'D.
14 PITCH 49 TEETH
1 REQ'D
14 PITCH 21 TEETH
4 REQ'D
CRANK HANDLE 1 REQ'D. FINISH ALL OVER
BODY SLAB 1 REQ'D. FINISH ALL OVER
STEEL BASE FINISH ALL OVER 1 REQ'D
.625 REAM 5 HOLES
45°
CHAMFER
1/4" TAP 3/8" DEEP
3" DRILL

FIG. 1. DETAILS OF ROPE TWISTER

Besides these variations, the general proportions of the body and handles may be modified to nearly any desired shape. Then, of course, a gear case of sheet metal, which is not detailed here, should be devised. The whole machine can thus be worked into a very pleasing problem for both the embryonic engineers and mechanics.

Some of the readers interested in this project might be very familiar with the use of the machine, but for the uninitiated, a few directions are added. The process described and illustrated in Figure 3, is for the making of a six-strand rope, but four- and eight-strand ropes can be made by the same process by using either two or four of the hooks instead of three.

Tie one end of the twine to the weight hook, near the center, and thread the machine as indicated by the arrows. Fasten the other end of the twine to the weight hook. Turn the crank so that the hooks revolve in the directions of the arrows. (See A, Figure 3.) Continue turning until the strands on each hook are firmly twisted together. Insert the pin shown at B, Figure 3, to prevent the various strands from twisting together. Remove the strands from the hooks on which they have been twisted together, and being careful to prevent untwisting, loop them over one of the hooks as shown at C, Figure 3. Turn the crank in the opposite direction as indicated by the arrow until all of the twists of the first operation are removed, and the rope is completed.

A SIMPLE WEEDER

Allan V. Winegard, Roslyn, Pa.

The weeder described herewith is a useful article which can readily be made by the boys in the junior high school. A broomstick may be used for the long part of the weeder handle, and the palm grip is a simple turning job.

The weeder itself is made of No. 22-gauge galvanized iron. After laying it out, it is cut out with a pair of tinners' snips and all edges are filed smooth. It is then bent around the broomstick and fastened with brass wood screws.

To use the weeder push the point in the ground a distance away from the weed. Then turn the instrument around. The dirt around the root comes out with the weeder and the weed can easily be removed without stooping.

SODA TREATMENT IMPROVES JOINT STRENGTH OF WOOD AND GLUE

The Forest Products Laboratory at Madison, Wis., has issued a circular in which it is stated that caustic-soda treatment improves the strength of certain woods when glued. It was found that a 10-per-cent solution of caustic soda gave the best results in the tests. Joints of hard maple, yellow birch, white oak, red oak, red gum, black cherry, basswood, and osage orangewood were treated with caustic soda. All of these showed a decided improvement in strength over joints that were not treated with the solution.

The wood surfaces to be joined are brushed with the soda solution, and after a period of 10 minutes, are wiped with a cloth to remove any excess solution or dissolved material, and allowed to dry before they are glued. It was noted that the shearing strength of wood in resisting slipping of a piece of untreated wood, glued under favorable conditions was 3,110 pounds, as compared with 1,570 pounds for an untreated piece in which starved joints are manifest, and 3,250 pounds for a piece treated with caustic-soda solution, but glued under the same starved-joint conditions.

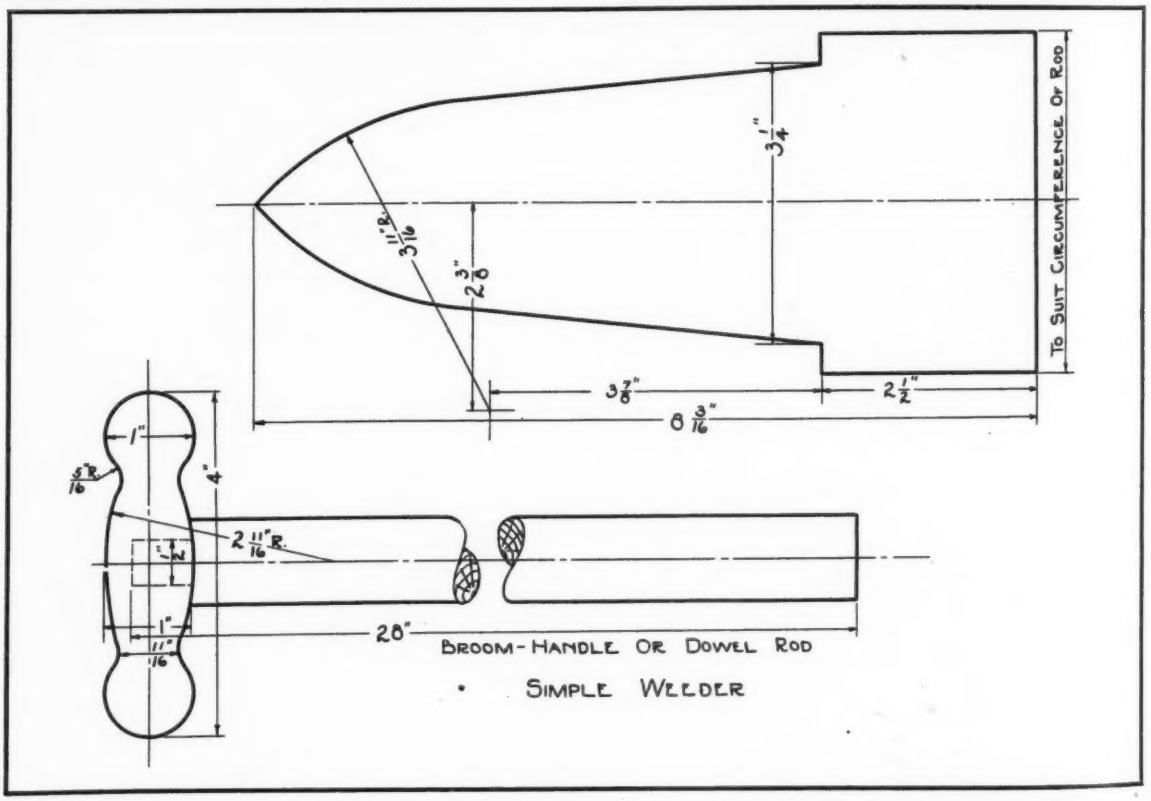
While the caustic-soda treatment has been found effective in improving the strength of joints produced with certain woods and glues, its use has been recommended only where good results are unobtainable with standard gluing practice.

AN ELECTRIC MOTOR

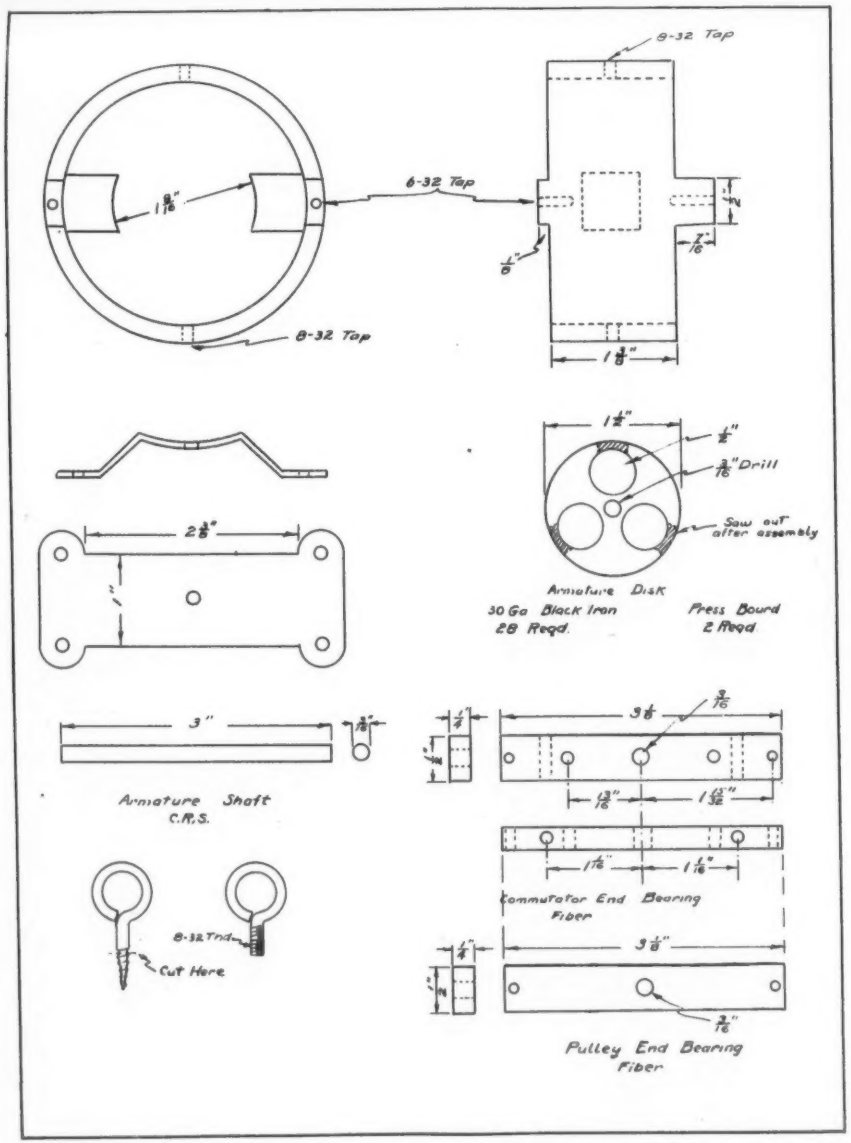
Robert F. Davis, Hibbing Junior College, Hibbing, Minnesota

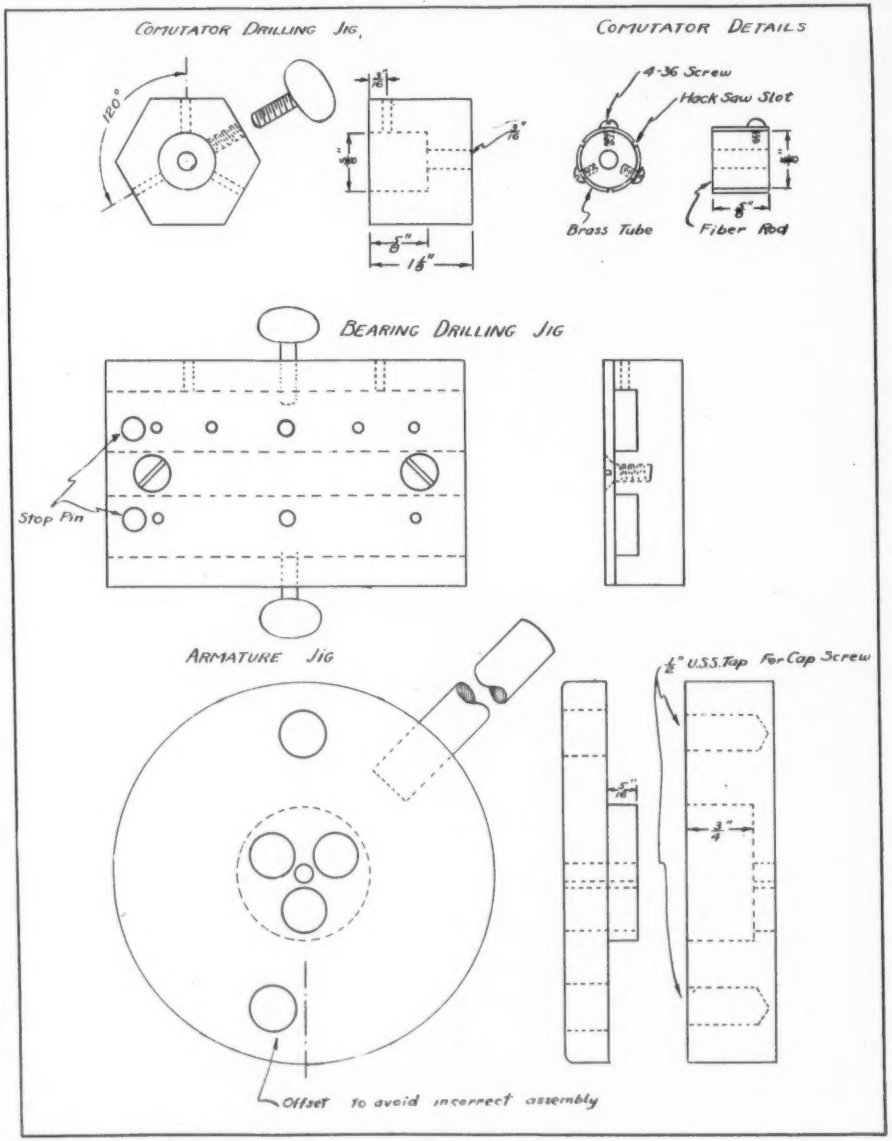
The construction of a practical electric motor of conventional design in a seventh-grade class may at first seem to be too advanced a problem, but with careful supervision and the proper equipment the boys can do a very creditable piece of work. The motor described here will do all that can be expected of the usual toy motor, running from battery current or equally well from a step-down transformer. This machine will also function as a generator. The total cost to the pupil should not exceed 50 cents.

Numerous experiments were made with laminated fields cut from sheet iron with hand snips, but the cast-iron frame



• Simple Weeder





ELECTRIC MOTOR, DESIGNED BY ROBERT F. DAVIS, HIBBING JUNIOR COLLEGE, HIBBING, MINN.

and field was finally adopted as it gives a better foundation to build around and simplifies the construction considerably.

The pattern for the frame is a simple split pattern and is cast without feet, the feet being cut from 14-gauge band iron, which may be salvaged from bundled sheet metal. The base is laid out from a template and cut out with a cold chisel; then it is filed to shape and bent in the vise.

The frame should be filed smooth before attempting to lay out the six holes which must be drilled. The holes for the bearing strips should be laid out as carefully as possible, and it is advisable to drill them at least five eighths of an inch deep so that there will not be so much danger of tap breakage.

The armature punchings presented quite a problem as we have no punch press. All scrap black iron from the sheet-metal shop was saved and 25 round discs were marked out with the dividers for each motor. These were cut out with tin snips to fit into the jig which is shown in the sketch. A pressboard disc should also be put on each side of the iron discs. The stack of armature discs are clamped in the jig and a ½-in. drill is run through the entire pack. The 3/16-in. shaft hole is drilled at the same setting. As soon as the laminations have been removed from the jig, they should be assembled on a 3/16-in. shaft and given a good coating of shellac to hold them together. After drying, the entire assembly may be placed in the vise and a fine-tooth hack saw used to cut the slot, which completes the armature punchings. These punchings may be purchased, but we find that by making them in the shop all of the scrap sheet iron is utilized and the work has some educational value.

The shaft is ordinary 3/16-in. steel welding rod, or may be cold-rolled steel if it is available. In some cases the shaft was not a tight fit in the armature and this was remedied by tinning the shaft and then driving it into the armature.

The bearing strip for the commutator end of the armature shaft is made of sheet fiber, as it carries the brush holders and binding posts for wire connections. The fiber seems to serve very well for the shaft bearing.

The commutator appeared to be a difficult piece to construct, but it really does not offer much difficulty. A piece of brass tubing which fits snugly over a fiber rod is cut to length and may be stuck on with shellac if desired. This is dropped into the hexagonal jig, and after drilling the shaft hole the three small holes are drilled and tapped for 4-36 brass screws. These screws are put in place and the segments are formed by sawing three slots with a fine-tooth hack saw. The commutator should not be pressed on the armature shaft until after the winding has been done.

Before winding, a small strip of empire cloth should be stuck in each armature slot to prevent chafing the insulation on the wire. Each pole should have 30 turns of No. 26 d.c.c. wire wound on, and care must be exercised to keep all windings in the same direction. The starting ends of all coils should be twisted into a rat-tail splice and soldered. The commutator may now be pressed on the shaft and the slots in the commutator should line up with the center of the armature slots. The free ends of the armature coils may now be soldered to the commutator screws. Connect the wires from the armature to the segment ahead of the one opposite the coil. This completes the armature.

The field coils are wound on a form and consist of 70 turns each of No. 24 d.c.c. magnet wire. After winding, they should be shellacked and then carefully removed from the form and wound with a layer of white cotton tape and again shellacked. The coils are wound flat, and the curve which fits the frame is formed over a piece of pipe or a mallet head. The field coils are retained in position by two strips of sheet brass.

The brushes are made of thin spring brass, which is soldered into the slot in the screw head which holds them firmly in the fiber bearing strip.

A PRACTICAL GUARD FOR SQUARING SHEARS

Although hand or foot-power machines are not considered hazardous in themselves there are many accidents on such machines as squaring shears.

One of the reason for the accidents is the fact that when the operator's foot is on the treadle his body can be thrown off balance very readily. This causes the hand to slip under the cutting knife and at the same time his foot presses the treadle down.

Mr. Herbert L. Reid, safety inspector for the New York State Department of Labor, writing in the Industrial Hygiene Bulletin, describes a guard for squaring shears, which is intended to prevent accidents during the operation of cutting from reeled stock, or slipping of the stock from the hands which may cause injury through an attempt at recovery.

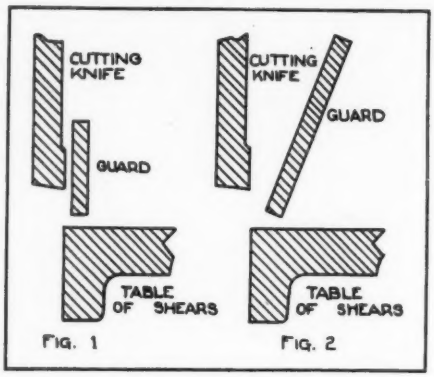


FIG. 1 FIG. 2

Some foot-power squaring shears are equipped with a straight band guard in front of the cutting knife (Fig. 1), which is satisfactory so long as the operator is cutting material held against the back or front gauge. In cutting to a line on the material it sometimes becomes necessary to remove the guard to see the point of operation, and when once removed such a guard is seldom returned.

A condition of this kind can be avoided by setting the band guard at such an angle (Fig. 2) that the operator can see the point of contact when standing in regular operating position. A guard of this type is not required when there is an automatic clamp extending completely across the front of the cutting knife and the cutouts have been filled in or otherwise guarded.

A COMBINATION TABLE

John Y. Dunlop, Greenfield, Tollcross, Glasgow, Scotland

The table for many purposes shows a good project for the advanced high-school pupil. The design is worked out with the Adam Brothers style of legs harmonizing with the rest of the table.

The construction of the table frame is much on the same lines as other tables with mortise-and-tenon joints, but the arrangements of the tops for the different purpose is rather complexed which makes it a thought-provoking project.

It involves both hand and machine work, such as boring, tapering, coping and band sawing, beading, miter jointing, mortising and tenoning, and hinge fitting.

The table part is constructed with mortise-and-tenon joints as shown in Figure 4, and the frame rails are kept flush with the legs. The reason for this is the plant table top is fitted over the framing and the flush framing makes a close fit with the inverted tea tray.

The writer has found that the mortise-and-tenon joints give the most satisfaction in the framing of this table.

The selection of the wood to be used is a matter of individual taste. Both mahogany and walnut work well and when used with maple or birch in the inlaid chess top, give sufficient contrast.

The method of procedure in constructing the table is as follows:

1. The legs are squared, bored, and tapered using a ¾-in. auger bit with legs clamped together.
2. The legs are mortised.
3. The rails are squared, bored, band sawed, and tenoned to fit mortises in legs.
4. The rails for the lower shelf are cut out to shape, finished with the spokeshave, and tenoned to fit the mortises in the inner arris of the table legs.
5. Assemble the table frame.
6. Miter the frame on which the chess-table top is to swing

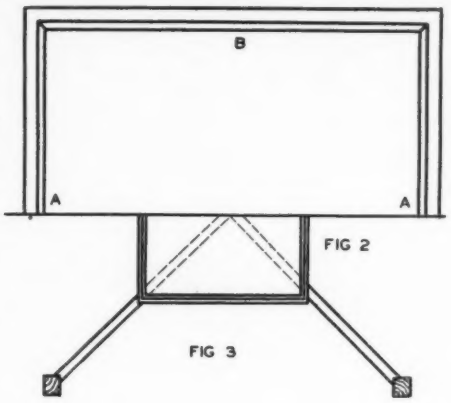


FIG 2

FIG 3

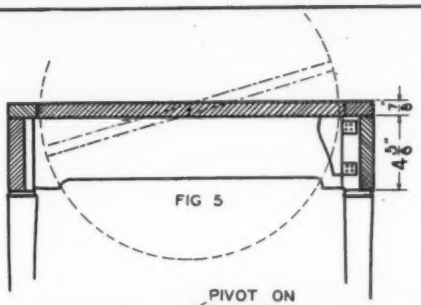


FIG 5

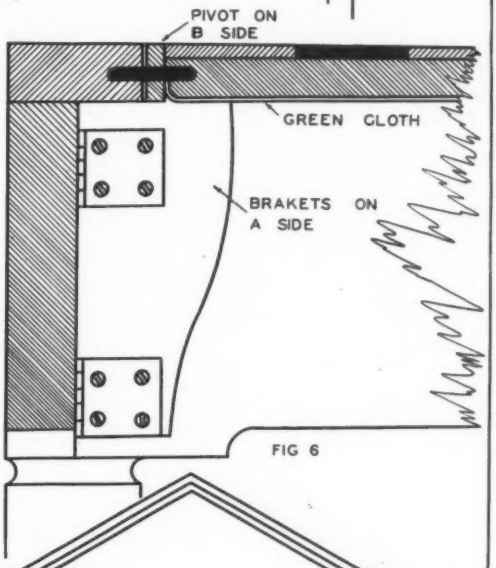


FIG 6

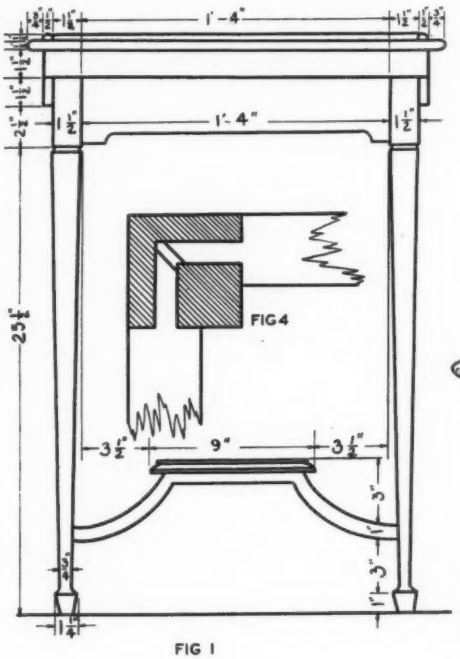


FIG 1

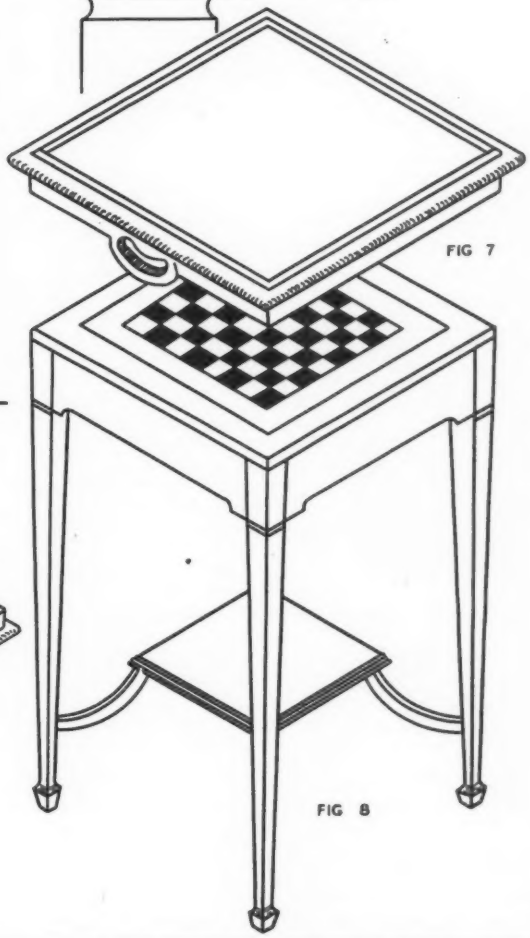


FIG 7

FIG 8

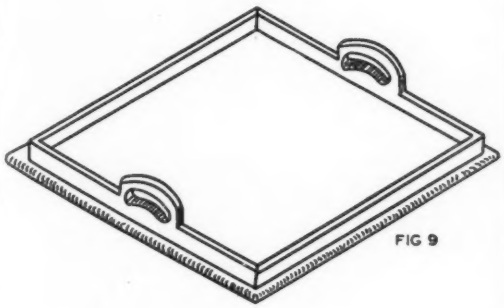


FIG 9

COMBINATION TEA TRAY,
CHESS, AND CARD TABLE

COMBINATION TABLE, DESIGNED BY JOHN Y. DUNLOP, GREENFIELD, TOLLCROSS, GLASGOW, SCOTLAND

and fix it temporarily in position.

7. Make the brackets to support the top and hinge on the middle of the A sides of the frame.

8. Build the chess-table top by inlaying with walnut and maple or birch on a ½-in. board. Cover underside with green cloth and surround the top with ¼-in strip. (See Fig. 6.)

9. Bore the edge of the top for pivots and hinge to swing right around, Figure 5.

10. Mold the lower top on the four edges and screw into position.

11. Cut out the handle sides of the tea tray, Figure 9, and miter dovetail to straight sides.

12. Screw the bottom of the tray to the sides and cover the screw head with the small bead shown on the table top, Figure 7.

13. Fit the inverted tea trap onto the frame. (See Figs. 7 and 8.)

14. Use varnish or wax finish.

Bill of Material

4 pc.	1½ x 1¾ x 30	Legs
4 pc.	¾ x 4⅝ x 18	Rails
2 pc.	⅝ x 4 x 27	Bottom Rails
1 pc.	½ x 9 x 9	Bottom Top
2 pc.	⅝ x 2 x 4½	Brackets
4 pc.	⅞ x 2 x 19	Frame for Chess Top
1 pc.	½ x 16 x 16	Top for Inlay
4 pc.	⅛ x 1½ x 13	Maple
4 pc.	⅛ x 1½ x 13	Walnut
4 pc.	⅛ x 2 x 16	Maple
4 pc.	¼ x ¾ x 16	Frame
1 pc.	½ x 22 x 22	Top
2 pc.	½ x 1½ x 20	Sides of Tray
2 pc.	½ x 3 x 20	Handle Sides
4 pc.	½ x ½ x 20	Beads

OXYACETYLENE WELDED WROUGHT-IRON BRIDGE LAMP

R. F. Jennings, South High School, Minneapolis

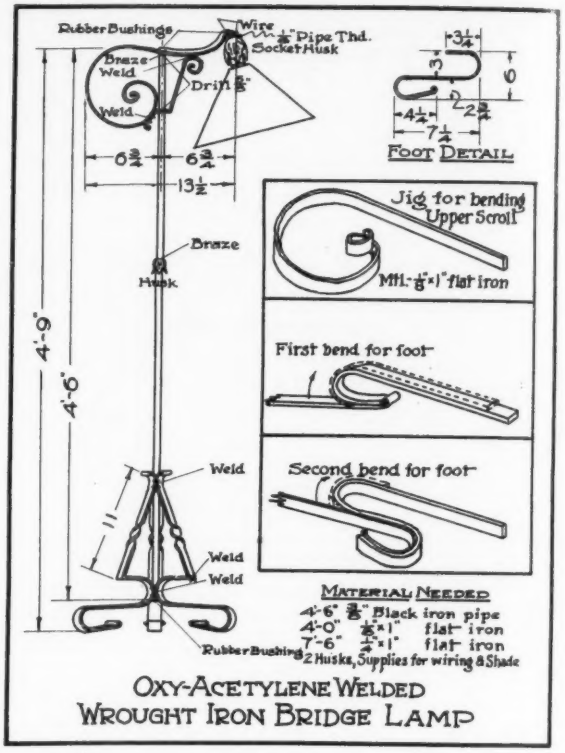
An easily made project in wrought iron is the welded bridge lamp shown herewith. Although it can, of course, be made by individual students, the writer finds that it lends itself particularly well to quantity production.

When the class has completed sufficient projects to give practice in the fundamental operations of forging, viz., drawing out, upsetting, forge welding, hardening and tempering, etc., the time comes when a production problem may be made highly worth while.

This gives an experience in teamwork and cooperation coupled with speed and accuracy and more nearly represents conditions in industry than previous projects. The boys usually need no further motivation than to be shown a finished product and told that they will have a chance to make a quantity like the sample on a factory basis, with their own student foreman in charge of the work.

The plan is as follows: Several days prior to the starting of actual production, the instructor teaches the various operations to individual students. The foreman, who has been selected on a basis of craftsmanship and general ability, accompanies him and learns all. When production starts, one boy drills holes, another forges and bends feet, two more bend scrolls, another pair does the oxyacetylene welding, etc. The jobs can then be rotated so that every student eventually does every job. The foreman, in addition to overseeing the various operations in process, does the inspecting and insists upon first-class work.

Nine boys out of the writer's forge class recently constructed thirteen bridge lamps, while the balance of the class was working on another production problem. The actual time spent on the problem, which included cleaning, sandpapering, and lacquering in various colors, was fifteen hours, which represents a rate of one lamp every 69 minutes the group worked, or one for each 10½ hours of individual work. When the same bridge lamps are made one at a time by students working alone, from two to three times as much time is necessary, depending upon the ability of the student.



OXY-ACETYLENE WELDED WROUGHT IRON BRIDGE LAMP

The bending jigs shown are not absolutely necessary, and when only one lamp is to be constructed, time can be saved to forge the parts without their use. However, if more pieces are to be made at a later date the jigs are a good investment.

The steel welds are all made with 3/16-in. nickel-steel filler rod and should require little, if any, grinding or filing. The top scroll and brace should be welded to each other with a No. 2 tip, and the lower welds with a No. 4 tip. If no previous practice in torch welding has been had, it would be well to try a few welds on scrap pieces first.

The center husk and top scroll are brazed to the pipe using a No. 4 tip, ⅛-in brass spelter wire, and a good brazing flux. But let us stop here and consider the cost.

If the crux of the wider use of the welding torch in our school shops is the expense of the oxygen and acetylene gases used, it may be interesting to know that in the construction of the thirteen bridge lamps mentioned, the welding gas did not cost the school one penny. The following plan was suggested by the supervisor of industrial training:

The students elected a chairman, who, with the help of the instructor, estimated the cost of all material and collected prorata from each student. He then proceeded, with the help of the instructor, to order material where he could buy it cheapest. The completed ironwork ready for wiring cost $1.50 per lamp. This included the cost of 400 cubic feet of welding gas.

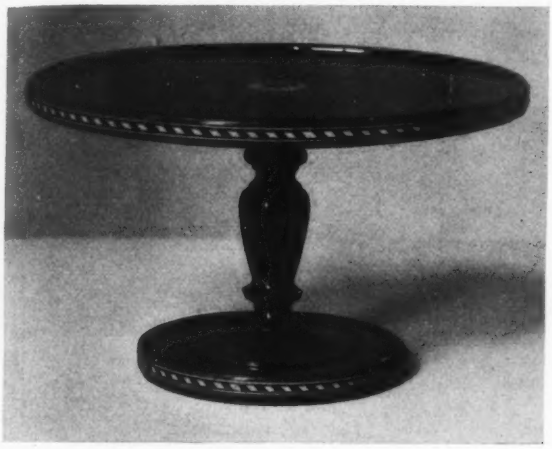
The electrical supplies and shade did not bring the total cost in most cases over $3 per lamp. The cost of the shade ranged from 25 cents to $5, depending upon the amount the student could afford to spend. The shade shown in the photograph is made of paper parchment, edged with a black and gold braid, and cost 50 cents.

Although simple in its construction, there is enough to this lamp to offer a real challenge to the boy who undertakes to make one.

CAKE SALVER

Paul N. Wenger, Supervisor Manual Arts, Greenwich, Connecticut

The design for the cake salver offers something unusual for the lathe students. In appearance and design, it resembles the old glass and silver cake salvers which were used years ago. It is a diversion from the old type of lathe problems which are usually followed in a lathe course. Because of the small amount of material used, and because of the relative simplicity in turning, this project is very popular with the students.



The project may be made with or without the inlay. The design is especially adapted for inlay, however, and therefore the two strips of inlay should be included, if possible.

The base, stem, and top are relatively thin, and thus may be turned upon a small faceplate as a single unit. The support of the dead center should be used upon the top for the turning and sanding, after which the dead center may be removed and the mark may be cut away. The finishing should be done upon the first (slow) speed. Do not turn it at a high speed after removing the dead center.

Any good cabinet wood that takes a natural finish may be used in making the cake salver. Walnut wood was used in making the one that is shown in the illustration. Select stock that is thoroughly dry. If the material is not sufficiently dry, the thin top and base may warp, causing much difficulty with the inlay work.

The stock for the project should have the following dimensions: Base, 1¼ by 5¾ by 5¾ in.; top, 1½ by 10¼ in.; stem, 1½ by 5 in. The three pieces may be glued together, as shown in the drawing, and the project may be turned as a single unit. Due to the fact that the stem is rather thin, the top should be inlaid, turned, and sanded before turning the stem to the given design. This eliminates the danger of breaking the stem while turning the project.

To protect the surface upon which the finished cake salver will be placed, the base should be covered with felt. A transfer picture in the center of the top greatly enhances the appearance of the finished article .

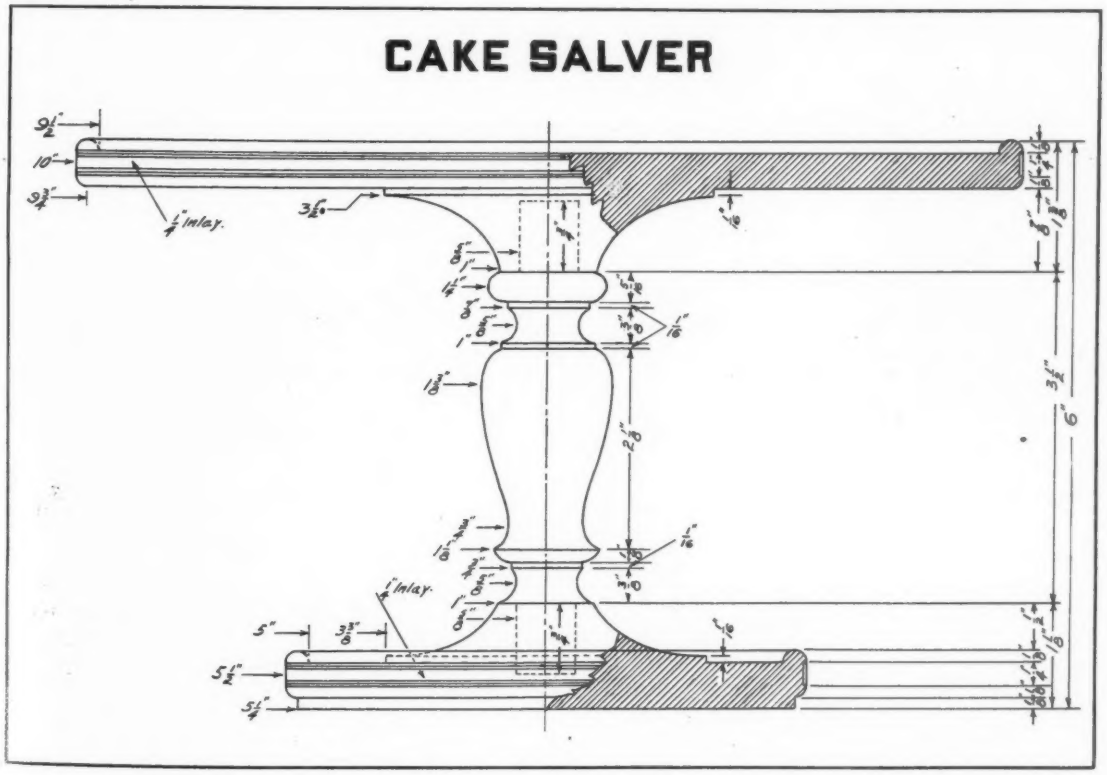
SHORT CANDLESTICK

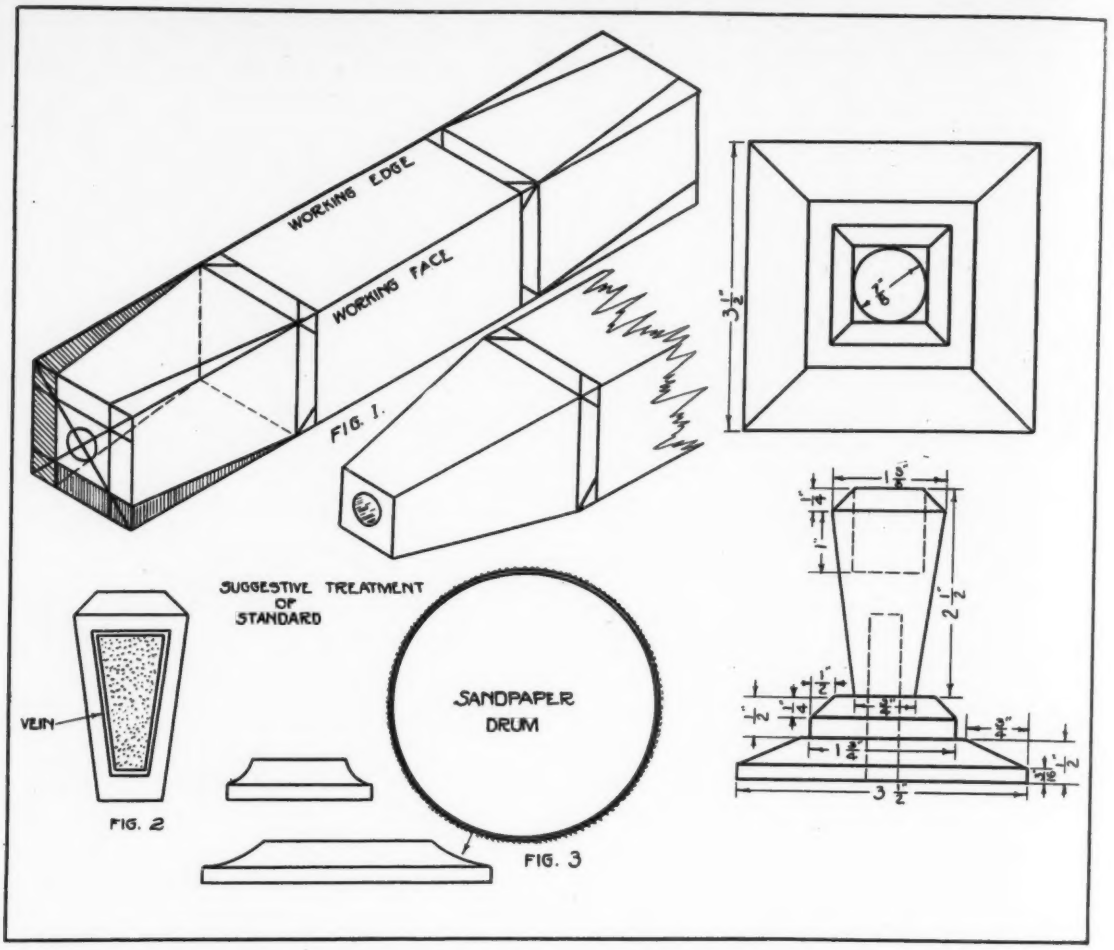
John Capel, Public Schools, Owen Sound, Ontario, Canada

Walnut makes the prettiest candlesticks, especially if the parts are taken from a board near a knot. The parts are very small, hence waste ends of black walnut boards can be used. These can frequently be obtained from furniture factories for the asking.

Figure 1 suggests a method of laying out and shaping the posts. The waste wood is removed with a saw and then the stick worked to the finished line with a plane. A ⅜-in. hole is bored in each end. The posts are then cut apart, and a ⅞-in. hole is bored in each one. Use a forstner bit. The tops are then chamfered.

Figure 2 suggests a two-tone effect. This method may be used on gumwood. The vein is cut in the sides with a large size dentist drill placed in a drill chuck and used in the live spindle of the lathe. A table with a guide is bolted to the bed of the lathe just under the dentist drill. The blocks to be veined are placed on the table, against the guide, and then pressed forward against the dentist drill.





CANDLESTICK DESIGNED BY JOHN CAPEL, OWEN SOUND, ONTARIO, CANADA

Figure 3 illustrates a method of shaping the base after it has been chamfered. A small sandpaper drum is placed in the lathe and the base of the stick is brought in contact with the sand drum. A smaller drum is used on the upper portion of the base and the top of the standard.

A WALNUT BUFFET

E. A. Lair, Jacksonville High School, Jacksonville, Ill.

While the building of a buffet is usually considered a large problem for the school shop, it must be remembered that after all it is merely cabinet construction on a little larger scale than usual.

The average student will experience no difficulty in building the described buffet.

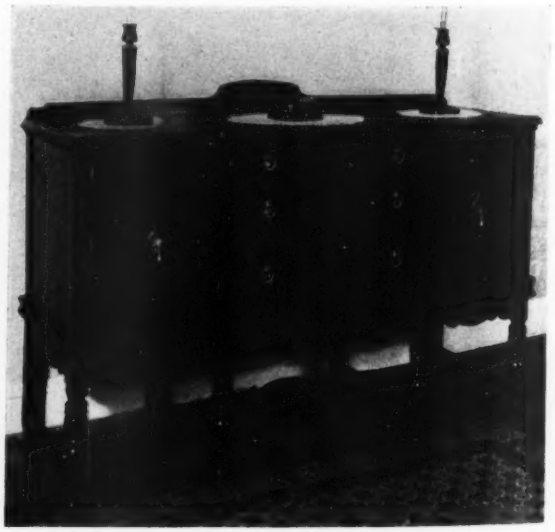
The first thing to construct is the frame, and of this the legs should be made first. The lower part of the legs are built up in order to be made 3 in. square for turning. This is done by gluing two pieces of the required length on opposite sides of each of the legs. When dry, glue on the other pieces so as to make the legs 3 in. square, for a distance of 12 in. from one end.

These may then be turned to the desired shape and then mortised for the rails and stretchers. Legs serving on the ends and back of the cabinet should be grooved for the panels, using the dado head on the saw spindle.

The next thing to construct is the frame. This consists of the eight legs, all rails and stretchers. It is best to construct the front, back, and ends as separate sections.

In the front section, the upper and lower rails are fitted into the legs, the middle section first, then the end sections. The rails for the drawer slides are also fitted in at this time and the entire front section is then ready for gluing.

The back consists of the four straight legs, three panels and the upper and lower rails. Mortise and fit the rails into the legs, placing the panels in their proper places and glue this section together, taking care to keep everything square while pulling the parts together.



WALNUT BUFFET

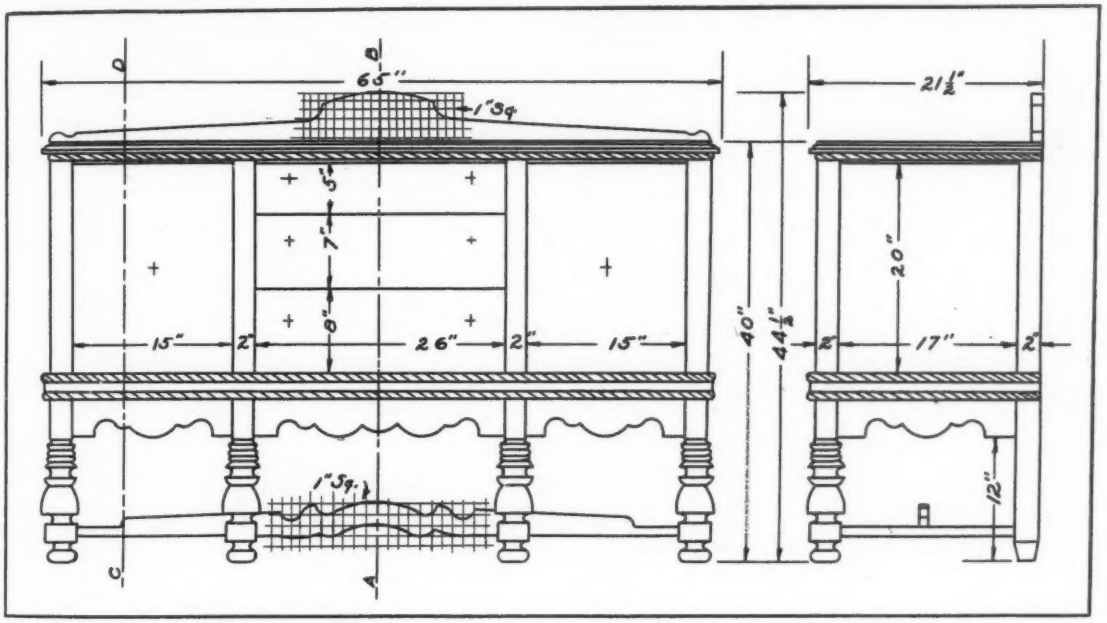
The ends consist merely of the upper and lower end rails and the end panels. As the back section has been glued and the front section is complete, all that remains is to glue up the stretchers and connect up the sections by gluing in the end rails, panels, and stretchers.

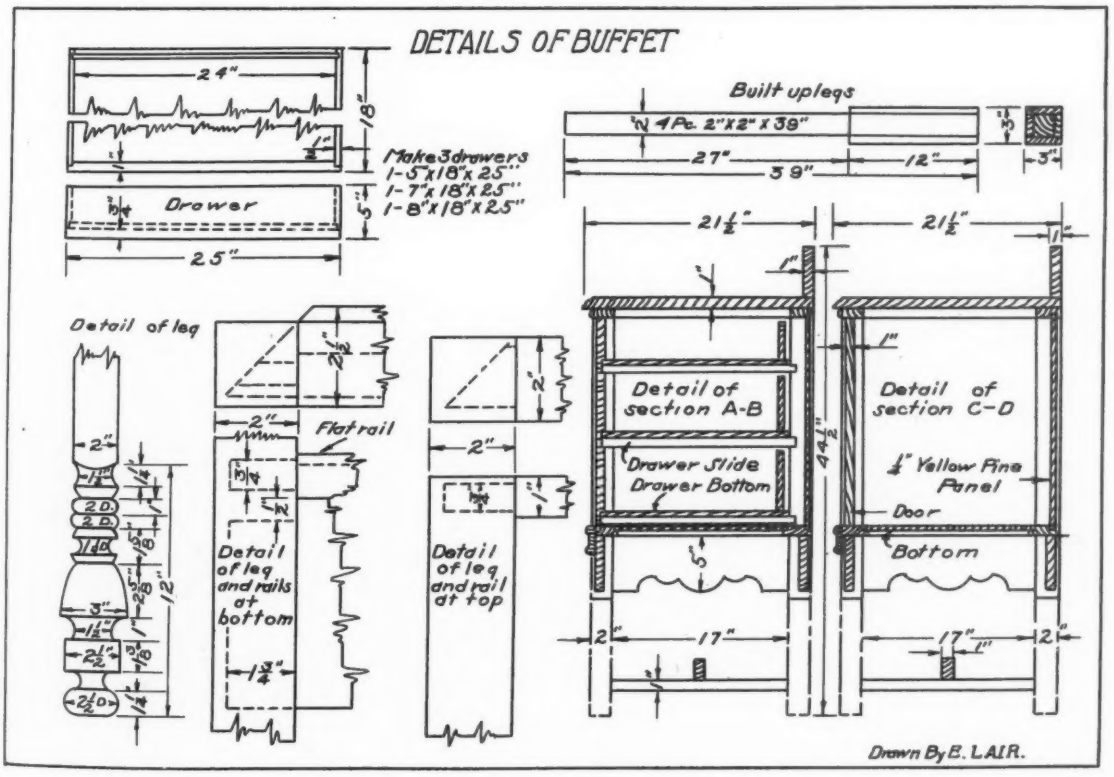
In gluing, much care should be taken to see that all joints are properly drawn to place. Surplus glue should be removed with cloth and hot water, and the entire frame should be tested for squareness. After the glue has dried, the frame should be cleaned, scraped and made ready for the fitting of the drawers and doors.

The drawer fronts are of solid walnut, (matched) while the doors are of 5 ply, matched 4 ways. This prevents warping and swelling of the doors and gives much more satisfaction where large doors are used.

The bottom is fitted in last. It is made in three pieces, each piece fitting into the grooves made in the bottom flat rail for this purpose.

The band and molding at top and bottom may be put on any time after the frame has been constructed. Any style molding will do for this purpose as long as it is in keeping





with the design. This molding and trim may be purchased from any ornamental wood fiber products company.

The top is fastened on with screws through the upper rails.

The buffet may then be given a varnish finish. It should be sponged very lightly with warm water to raise the grain, then allowed to dry thoroughly, and then rubbed down with 000 sandpaper. A coat of walnut water stain should then be applied, and about 24 hours allowed for drying. After this it is filled, and then given a thin coat of shellac, about 50-50. This is followed in turn with three coats of varnish, each being rubbed down with 3-F pumice stone, the last coat also being rubbed with rottenstone and oil and finally cleaned up with a good grade of furniture polish.

Bill of Material

1 pc.	Walnut	1 x 21	x 65	Top
8 pc.	Walnut	2 x 2	x 40	Legs
1 pc.	Walnut	1 x 4½	x 63½	Back Piece
2 pc.	Walnut	1 x 15	x 20	Doors
1 pc.	Walnut	1 x 5	x 26	Drawer Fronts
1 pc.	Walnut	1 x 7	x 26	Drawer Fronts
1 pc.	Walnut	1 x 8	x 26	Drawer Fronts
2 pc.	Walnut	¼ x 17¼	x 20½	Ends, 3 ply
1 pc.	Walnut	½ x 2½	x 65	Band, (lower front)
2 pc.	Walnut	½ x 2½	x 21½	Band, (lower ends)
2 pc.	Walnut	1 x 5	x 19½	End Rail, (lower)
2 pc.	Walnut	1 x 5	x 17½	Front Rail, (lower)
1 pc.	Walnut	1 x 5	x 28½	Front Rail, (lower)
4 pc.	Walnut	1 x 2½	x 19½	End Rails
4 pc.	Walnut	1 x 2½	x 17½	Front Rails
2 pc.	Walnut	1 x 2½	x 28½	Front Rails, (middle)
4 pc.	Birch	1 x 2½	x 19½	Inside Ties
1 pc.	Walnut	1 x 3½	x 63	Long Stretcher
4 pc.	Walnut	1 x 1¾	x 20	Short Stretchers
2 pc.	Fir	¼ x 15	x 17	Bottom, 3 ply
1 pc.	Fir	¼ x 15	x 17	Bottom, 3 ply
2 pc.	Fir	¼ x 15½	x 20½	Back, 3 ply
1 pc.	Fir	¼ x 20½	x 26½	Back, 3 ply
3 pc.	Fir	¼ x 18	x 24½	Drawer Bottoms, 3 ply
3 pc.	White Pine	½ x 5	x 24½	Drawer Ends, 3 ply
	White Pine	½ x 7	x 24½	
	White Pine	½ x 8	x 24½	
2 pc.	White Pine	½ x 5	x 18	Drawer Sides
2 pc.	White Pine	½ x 7	x 18	Drawer Sides
2 pc.	White Pine	½ x 8	x 18	Drawer Sides
6 pc.	Birch	1 x 2	x 19	Drawer Slides
27 ft.	Wood Fiber	¼ x 1	lineal mold or trim	

AUTO REPAIR OR STORAGE JACK

C. Forrest Felix, Garfield Junior High School, Johnstown, Pennsylvania

The auto jack described herewith is very solid and can be made at little cost. It takes the place of the old-type improvised wood horses, blocks, boxes, etc., that are ordinarily used to support your car when it is up for repairs, painting, or winter storage. It eliminates the danger of having the car slide off, or of having the old type of blocking collapse suddenly.

The height of the pack can be made to suit any car. They are made very easily and with the use of very few tools.

Tools:

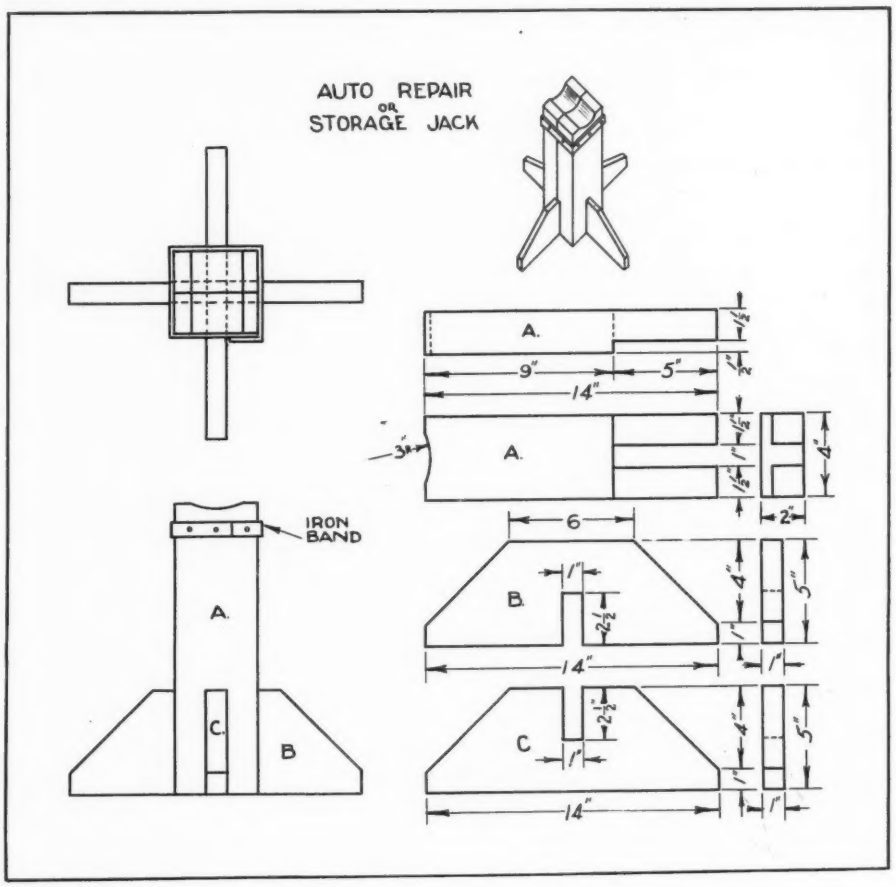
Rule, square, cut-off saw, rip saw, screw driver, ¾-in. wood chisel, hand drill, twist drill to suit size of screws.

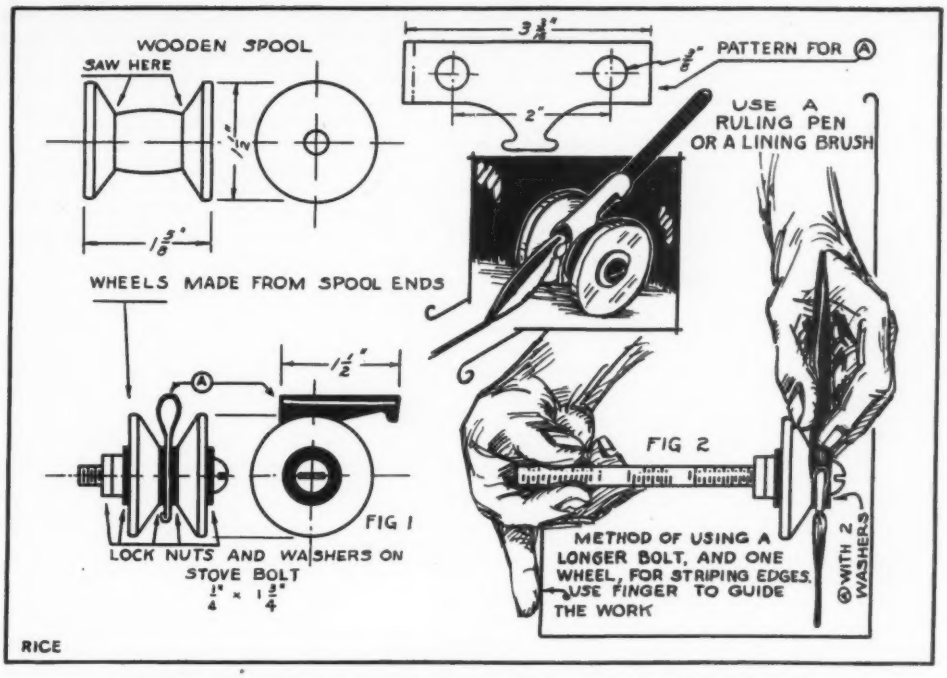
Material:

2 pc.	2 x 4	x 14	Poplar or Oak
2 pc.	1 x 5	x 14	Poplar or Oak
1 pc.	1/16 x ¾	x 17½	Soft Flat Iron
20	No. 10 3-in. Flat Head Screws		

Directions:

Prepare two of the pieces marked *A* and one each of *B* and *C*. After the pieces are assembled, they are fastened together with screws. The top of the blocks are then reenforced




WOODEN SPOOL
SAW HERE
WHEELS MADE FROM SPOOL ENDS
LOCK NUTS AND WASHERS ON STOVE BOLT
FIG 1
PATTERN FOR (A)
USE A RULING PEN OR A LINING BRUSH
FIG 2
METHOD OF USING A LONGER BOLT, AND ONE WHEEL, FOR STRIPING EDGES. USE FINGER TO GUIDE THE WORK
(A) WITH 2 WASHERS
RICE

DEVICE FOR STRIPING DESIGNED BY CHARLES RICE, EVERETT, WASH.

with the flat iron as shown in the illustration. The groove across the top of the post may be made with a 3-in. radius. This depression will tend to keep the car from accidentally slipping off the jack.

SIMPLIFIED STANDARDS FOR COLOR

The Division of Simplified Practice of the U. S. Department of Commerce has taken steps toward the simplification of colors in commerce in order to reduce the variety of shades, hues, tints, and colors.

The division brings out the fact that manufacturers must frequently have their capital tied up in extra equipment in order to maintain the production of a full line of colors. The inventory of stock is rendered more complex and expensive, and there must of necessity be additional storage facilities.

The economic advantage of conforming to a simplified list of colors is readily seen when it is shown that too great a variety of colors results in overdiversification and overstandardization which stultifies and restricts. Simplification, intelligently and moderately applied, it is urged, offers a happy medium between these two extremes.

A METHOD FOR STRIPING METAL OR WOODEN OBJECTS

Charles Rice, North Junior High School, Everett, Washington

The finishing touch which adds so much to certain types of projects is often avoided because of the inability of the average student to do a good job of striping. Many objects made in the metal shop lend themselves readily to that type of decoration. A dustpan finished in enamel will present a more snappy appearance if a stripe or two is added here or there near the edge. The same is true of wooden projects.

The object of this article is to present a method that will help the average student, without previous training, to do a fair job of striping. The two simple tools presented at Figures 1 and 2 in the accompanying illustration are interchangeable in that the metal holder (A), along with the wheels, nuts and washers are common to both. The metal brush holder (A) is made of a piece of sheet metal. It is placed between the two washers to assure freedom when the brush is in motion.

Ink Lines. If waterproof ink is used for the striping, a ruling pen may be used in the holder (A). If the surface is painted, a cloth containing chalk dust should be used over the surface before the ink is applied. Wide stripes may be made by drawing two lines and filling in with a brush. Protect the ink lines by spraying with clear lacquer or white shellac.

Paint Lines. A brush may be used in either tool for drawing lines with paint or enamel. The brush that is used for this work should point up properly, or a striping brush should be used. A straightedge may be clamped to the surface to serve as a guide when the lines are made at some distance from the edge or when the edge cannot be used as a guide.

VOCATIONAL SOCIETY OF BOSTON HOLDS MEETING

The Vocational Education Society of Boston, Mass., held its annual meeting on Saturday, May 11, at the Perkins Institute for the Blind, Watertown, Mass. The group made a tour of the shops, playgrounds, and living quarters of the school, with Mr. Julian H. Maybey, a member of the faculty, as guide. The buildings of the school cover an area of 35 acres, and the setting is ideal on the banks of the Charles River. The school has an enrollment of 280 students, of which 160 are in the upper school, and 120 in the lower one. The students come from New England and also from more distant states. The one hundredth anniversary of the founding of the school will be observed in 1932.

In the shops, the visitors were shown examples of work in weaving, basketry, and woodworking, and many were the expressions of surprise at the high standard of workmanship exhibited by the students. It was noted that very few special devices were necessary for these sightless pupils. Aside from the special books and embossed figures on the doors of the rooms, there was little difference between this school and any other.

Following the luncheon in the school auditorium, the visitors listened to a talk by Mr. Allen, the director of the school. Mr. Allen, in speaking of manual training, stated that the instruc-

tors did not aim to make the work of the school vocational, as it takes the blind person a great deal longer to do a piece of work. Although it is possible to teach them skill, their lack of speed seriously handicaps them. One of the lines of work in which they have been particularly successful is piano tuning, and a number of the graduates have taken up the work as a vocation. He pointed out that there are considerably fewer blind persons coming into the school at the present time. This decrease in numbers has been attributed to the progress in modern medicine. Mr. Allen deprecated the fact that graduates of the school have appeared unwilling to return to their home towns after graduation.

At the conclusion of Mr. Allen's talk, a business meeting was held, at which the annual election of officers took place. The society welcomed four new members comprising Mr. A. B. Walker, Mr. J. A. Dutelle, Mr. J. E. Nally, and Mr. Joseph D. Mahoney.

The following officers were elected for the year: President, Mr. James T. Gearon, Everett, Mass.; vice-president, Mr. Willis C. Brown, Arlington; secretary, Mr. Harold R. Wise, Boston, Mass.; treasurer, Mr. Louis A. Van Ham, Boston, Mass.; librarian, Mr. Forrest L. Mason, Quincy.—*Louis A. Van Ham.*

ANNUAL BANQUET OF SCHOOL CRAFTS CLUB

The twenty-seventh annual meeting and banquet of the School Crafts Club of New York City was held on Saturday, May 18, at the Geneva Restaurant. A total of 43 members attended the meeting.

Mr. Merritt Haynes, of the American Type Founders Company, was the speaker of the evening. Taking as his topic, "Some Old Stories," Mr. Haynes outlined the history of the Jewish people and described some of their fine craftsmanship, also Greek architecture and craftsmanship, and something about the life of John Guttenberg, the printer. He also told the story of the life of DaVinci, pointing out the variety of his accomplishments.

Mr. Hatch spoke on "The History of Manual Training and Vocational Education." He expressed himself as favorable to the present 6-3-3 plan of organization and pointed out that it had proved a great impetus to the industrial arts. Mr. Darling, Mr. Arnold, Mr. Beyer, and Mr. Hemion, past presidents of the club, each gave brief addresses.

The nominating committee was assigned the task of selecting the officers for the next year.

It was decided to discontinue the October meeting, and to hold the first meeting on the third Saturday in November.

The meeting adjourned at 10:45 p.m.—*Geo. W. Renneman.*

THE THIRTY-FIFTH ANNUAL CONVENTION OF THE WESTERN ARTS ASSOCIATION

No one who has attended a meeting of the Western Arts Association can fail to be impressed with the spirit of fraternal fellowship existing among the members of the organization. This, together with an optimistic enthusiasm in the attainment of their objectives in education, seem to be the outstanding characteristics of this small but live organization. The convention in Cleveland was no exception in this respect, except that these things were more than ever apparent.

The central theme of the convention was "The Development of the Individual through the Creative Arts." It was an excellent illustration of how we have shifted our point of view in education in the past one or two decades. The viewpoint has shifted from terms of subjects and subject matter, to individuals, to the unfolding and development of the minds of the young. Practically all of the talks were centered about the idea of discovering interests, aptitudes, and abilities. Subject matter and its organization was considered merely in connection with the problem of organizing it to meet the needs of the individual.

In two talks, "Measuring Executives" and "Measuring Men," Dr. Johnson O'Connor of the General Electric Co., Lynn, Mass., described the efforts he has made by means of tests, to discover and measure special abilities. He explained how workers in the General Electric Company's organization have been placed in positions where they could best use their special abilities. Industrial concerns are setting a pace for educators in this matter of testing for special abilities and capacities in individuals.

The work that Dr. O'Connor is doing should go a long way toward clarifying the definition of "general intelligence" as measured by psychological tests. Perhaps we shall see in the future that what we have been measuring is only one of many special abilities that an individual may possess.

Some of the interesting points brought out by Dr. O'Connor are:

1. "General" intelligence appears to be nothing more than a collection of special abilities.

2. A person with one outstanding ability is more likely to succeed than a person who ranks high in a number of abilities.

3. Nearly all persons lack some one element of general intelligence.

Charles Fabens Kelley, of the Chicago Arts Institute, gave the "Art-for-art's-sake" people something to think about. In his address "Art—the Essential Factor," Mr. Kelley referred to art as aesthetic engineering and showed how the economic factor in art has been the greatest factor for good in the production of a worthy art.

The idea set forth by Mr. Kelley also was emphasized by Mr. Henry Turner Bailey in his illustrated lecture, "What Europe is doing in Graphic and Industrial Arts Today." Mr. Bailey finds among artists the same three classes of people that are found in the economic and social life of the country. First, those who, by temperament, stay on the estate where they were born and never care to venture into new surroundings; second, the pioneers, who come from the same stock, but who are unwilling to remain static and must launch forth and take with them the best of their old possessions and their old life, and on this build a higher and better existence; third, those who would forget the old and establish something new and different. These three classes of people in the realm of art Mr. Bailey terms the conservatives, the progressives, and the "bolsheviks." He showed illustrations of the "damnworthy" art produced by this latter class of artists, and some beautiful illustrations of a new modern art that is conserving the best elements of the old and introducing new elements. The result will be a new art, better than the old, but one which has conserved all of the best in the old.

The sectional round-table discussions were of an exceptionally high order. The topics were well centered about the general theme of the convention, and the manner in which they were handled showed that the teachers of the arts, as never before, are organizing and conducting their work in a manner that makes it function in the lives of the boys and girls who are soon to become integral parts of our social and industrial order. Some of the old pioneers in the field of the industrial arts were Charles A. Bennett, of Bradley Polytechnic Institure, Mr. Robt. W. Selvidge, of the University of Missouri, Mr. Augustus F. Rose, Providence, R. I., and Mr. W. E. Roberts, of Cleveland, showed that although their hair has turned a bit gray, their minds are still young and alert.

A review of the convention would not be complete without a mention of the bus trip, which included stops at the Cleveland Public Museum of Art, the Cleveland School of Art, and Nela Park, where the laboratories of the National Electric Light Association are located.

At the banquet in the ballroom of the Statler Hotel, on the evening of May 2, one had an opportunity to take note of the fact that old age is not a matter of years. Were it not for the few gray temples one would have had a hard time separating youth from age.

The exhibits of the work of school children were of an exceptionally high order. The industrial exhibits also were artistically arranged and were instructive and inspiring.

The Association adjourned on Friday afternoon, May 3, to meet next year in Minneapolis. "See you next year in Minneapolis" was on every lip as farewells were said. It was the largest and best convention in the history of the organization. May the next one be even bigger and better!—*W. H. Stone.*

THE MEETING OF THE TULSA MANUAL-ARTS CLUB

"Furniture Design" was the topic for discussion at the last meeting of the Tulsa Manual-Arts Club. A talk was given by Mr. Perry, a competent commercial interior decorator of Tulsa. Mr. Perry, after graduating from the Tulsa High School,

studied art and decorating in New York and Paris. He showed that, to be well designed, a piece of furniture should possess balance, proportion, and pleasing curves; it should be of durable construction, of suitable material, and should be suitable to the purpose. Much help in designing articles to be made in the shop may be had by studying good furniture, both modern and period style. Visits to high-grade furniture stores and to museums are helpful. In the discussion, Mr. Lulow, of Central High School, asked how to teach a boy to read drawings, how to use tools and follow sound construction, and then find time to teach good design. A boy has little training in design and few ideas to fall back on.

Mr. Badger, director of vocational education, in his talk, said that artwork and shopwork ought to be closely correlated. The difficulty is, however, that art teachers are long on principles of art, and short on principles of sound furniture construction, and that with the shop teacher the condition is just the reverse. Mr. Badger believes that shop teachers should qualify themselves to teach and to apply elementary principles of design. He holds that if pupils were taught more design in the grades and in the junior high school, they would have an appreciable basis on which to build by the time they reached the high school.

Mr. Perry concluded the discussion by taking various pieces of furniture, and analyzing them from the point of view of design.

The final meeting of the club is to be in the nature of a picnic.

At the business meeting, the following members were elected on the program committee for next year: Mr. F. C. McCollough, president; Mr. J. W. Bollinger, vice-president; and Mr. H. E. Miller, secretary-treasurer.

CHICAGO DISTRICT—INDUSTRIAL-ARTS ROUND TABLE

The last meeting of the season of the Industrial-Arts Round Table of Chicago District was held on Friday, May 17, at Waukegan, Illinois.

Waukegan proved herself a gracious hostess. A special car was put on the North Shore Line for the Chicago Members, the train leaving Wabash and Adams Street in Chicago at 4 p.m.

Uniformed guides met the visitors at Waukegan and directed them to the high school. The hour and a half before dinner was spent inspecting the shops of the junior and senior high schools and the products made by the boys. Thorough organization was evident throughout, a fact which was further emphasized by the statement that 700 boys were accommodated each day in shops and drawing rooms, which by no means could be considered elaborate nor extensive. Examples of excellent work in woodworking, machine-tool work, and printing were on display, as well as many drawings and model houses. A large board in the auto shop interested us. The board was about 3 ft. wide by 25 ft. long, painted gray, and contained mounted specimens of auto parts from carburetor to rear wheel, all plainly labeled. There should be little excuse for slackness in nomenclature with such an exhibit at hand.

The dinner was an elaborate affair. The program and menu were printed by the school printshop, which also got out the various tickets used for transportation and dinner. Lieutenant M. C. Faber, U. S. N., in charge of aviation training at the Great Lakes Station, Great Lakes, Ill., spoke on "Training for Aviation." He surprised us with the statement that there were more individual airplane manufacturers than there were individual automobile manufacturers. Speaking further, he said, "Transportation officials used to fight new means of locomotion, but a happy sign of the times is the way in which aviation has been welcomed and utilized by the railroads in establishing air-line connection." He declared that the army and navy, were in large measure responsible for the present acceptance of aviation. They experimented and developed planes so that when Charles Lindbergh showed what a civilian could do, much of the experimental work had been done. Schools can do the "ground work" and make progress more rapid for those who take up flying.

Lieut. Faber outlined briefly the three courses given as ground work at Great Lakes: A 24 weeks' course in woodworking; a 24 weeks' course in metal working; and a 10 weeks' course in aviation mechanics. The latter might be called a "general course" covering bench, lathe, and wire work, fabric, elementary dynamics of flight, assembly and alignment of planes, theory and practice with internal-combustion motors, and servicing of planes.

At the close of the address, the meeting adjourned to reconvene at Great Lakes, six miles south. Autos were provided to transport the company of 94. The shops and classes were in operation by special arrangement. All the activities outlined by Lieut. Faber in his talk were seen and in addition, acetylene welding, sheet-metal work, plating, and fabric "doping."

At 10 p.m. the party left Waukegan again in a special car, giving to Mr. C. L. Jordon, industrial education assistant, and his helpers, heartiest thanks for an instructive meeting.

A new committee for the next year was appointed, consisting of James McKinney, Bruce B. Bell, C. I. Carlson, L. J. Lease, and William C. Brubaker.—*William C. Brubaker, Secretary.*

VOCATIONAL-EDUCATION SECTION OF THE N. E. A. TO MEET AT ATLANTA, GEORGIA

The vocational-education section of the National Education Association will hold its meeting in connection with the general meeting on July 1 and 2, at Atlanta, Ga. The general topic for discussion at the meeting will be "Education for a New World." Mr. P. W. Chapman, state director of vocational education for Georgia, will preside at the sessions.

Mr. T. E. Browne, of Raleigh, N. C., will open the meeting with a talk on "A Progressive State-Wide Program of vocational Education"; Miss Adelaide S. Baylor, chief of the home economics service of the Federal Board for Vocational Education, will talk on "New Problems in Home-Making Education"; Mr. B. E. Harris, of the University of Alabama, will discuss "New Features in Trade and Industrial-Education Programs"; Mr. D. M. Clements, state supervisor of agricultural education, Nashville, Tenn., will talk on "The Place of the F.F.A. in Training Farmers of Tomorrow"; Miss Anna L. Burdick, of the Federal Board for Vocational Education, will take for her topic "The Future of Part-Time Education"; and Mr. J. T. Wheeler, of the Georgia State College of Agriculture, Athens, will discuss "New Aspects of Farmer Training."

MEETING OF THE VOCATIONAL SOCIETY OF OF WASHINGTON COUNTY, PA.

A meeting of unusual interest was held by the members of the Vocational Society of Washington County, at the Mt. Pleasant Vocational School on Friday evening, April 26. Mr. George C. Donson, president of the society, presided. The speakers at the meeting were: Mr. L. H. Dennis, deputy superintendent of the state vocational department of Pennsylvania; Prof. H. G. Parkinson, head of the agricultural department at State College; Dr. C. V. Williams of the State Teachers' College, Manhattan, Kansas; Dr. G. D. Whitney, head of the vocational department of the University of Pittsburgh; and Mr. A. P. Williams of the Federal Board, Washington, D. C.

Mr. T. C. Ford of the Trinity High School reported on the industrial and vocational meetings, held at Reading during the annual teacher's meeting.

Mr. Dennis described the plans that are being made for the meeting at Eagle's Mere, June 28 and 29. A vote of thanks was given Prof. H. L. Pedicord, principal of the Mt. Pleasant School, for the excellent dinner which had been served by his home-economic department, and for his assistance in advertising the meeting.—*George C. Donson.*

ST. PAUL MANUAL-ARTS CLUB HOLDS MEETING

The Manual-Arts Club, of St. Paul, Minn., held a meeting recently, during which it was reported that the membership had increased from 12 to 59. Among the well-known speakers who addressed the meeting were Dr. C. A. Prosser of Minneapolis, Dr. Charles R. Allen, and Dr. Homer J. Smith. A number of prominent business and professional men of St. Paul also gave interesting talks before the members.

The calendar for 1929 is as follows: May 10, Ladies' night; June 8, Picnic.

The officers are Mr. H. G. Cahill, president; Mr. R. Powers, vice-president; and Mr. Daniel Shirck, secretary-treasurer.

NOW, ARE THERE ANY QUESTIONS?

Painting Car Fenders

878. Q.: I want to paint the under surfaces of the fenders, and other iron parts on my car, to protect them from the action of salt water. I intend to use the car near the ocean and have seen cars there painted with some red or orange paint similar to that used on iron bridges. Please advise me as to the kind of paint to use and good brands. Would a small spraying outfit be practicable in applying this paint?—*G. W. B.*

A.: Take the car to a washing station and have it "washed for painting," in which case all dirt and grease will be removed by a different treatment than would be used in most cases of washing.

Let the job dry over night, then clean off all loose paint and scales with sandpaper and steel scratch brush. Dust off and wash with a clean rag saturated with denatured alcohol. Open a can of "red-oxide oil, metal primer," stir well and clean from the bottom of the can and then thin if it is found necessary, with the thinner recommended by the manufacturer. Apply a well brushed out but even coat with a soft bristle brush or sprayer if it is available. Let dry 48 hours in a warm room, cuff off lightly with a split 6/0 finishing paper, dust off and give a second coat, drying as before.

Without sanding the second coat of metal primer, apply a coat of "sanding surfacer" after thinning the material to the consistency of heavy cream. Let dry and apply a second coat, and allow it to dry hard for at least 38 hours, after which it can be cut down close and level with a 6/0 "wet or dry" paper and water. Any spots cut through should be touched up with a brush or spray and redried.

For the final finish, use one or two coats of auto enamel, allowing each to dry hard before recoating. A high grade Badger brush should be used for the enamels since they are too stiff to be handled with a hand sprayer and should not be thinned. For work of this type use the products of Pratt & Lambert of Buffalo, N. Y., or the Murphy Varnish Co., or The Valentine Varnish Co., of New York City, or Dakalite Products Co., Cleveland, Ohio.—*Ralph G. Waring.*

Refinishing Statuary

879. Q.: Will you kindly advise me of the proper way to treat statuary? These are plaster-paris casts and have become dirty. What effect will white enamel have? Will white shellac be injurious?—*U. L. H.*

A.: Unless the plaster-paris casts, about which you have written, have been already painted, I would say give them a coat of white shellac to stop the suction and then follow this with any kind of finish that you would ordinarily want to use, whether it would be lacquer or paint or enamel. As a matter of fact, I imagine a spray job would be the best proposition for this statuary. For this purpose it would be just as well if the spraying apparatus is available to use clear lacquer, and then follow this with what other lacquer finish you care to put on.

Lye as a Paint Remover

880. Q.: Is strong lye water a successful paint remover? Will paint or varnish stick after wood has been treated with lye water? Can a vinegar bath revive the wood after lye water has been used?—*U. L. H.*

A.: I am not entirely in favor of the use of "strong lye water" as a medium for the removal of paint and allied materials.

Unless the work is done by someone who has had a great deal of experience with this particular material and understands its shortcomings and dangers, considerable trouble is likely to ensue. In the first place, a small splash in the eye is sure to be dangerous in the extreme; second, its action is very corrosive on the skin and can easily cause eruptions both painful and difficult to heal. Accidents will happen even though the hands be heavily greased before work starts; third, even though a considerable quantity of clean water is used for rinsing, no one can guarantee that the work has been correctly done; and fourth, it is almost obligatory that some neutralizing agent, such as vinegar, be employed to destroy the properties of the remaining traces of the alkali. In the last analysis, the method is so obsolete that it now appears only in inadequately edited books on paint practice.

If modern paint and varnish removers are not available, then Oakite, or Tromite, based on a major percentage of trisodium-phosphate, are the more efficient types. Vinegar may be used, either full, or half strength, but I find that for this work, a solution of one pound of boric acid per gallon of hot water well stirred into solution will give a neutralizing material best suited for this alkali, and in addition will give a fine bleaching action; the residium on the wood having no deleterious action on any subsequent coatings. Use two pounds per gallon of hot water, and apply freely.

If modern varnish removers are used, the work should be finally scrubbed with steel wool and denatured alcohol, not with gasoline or benzine as is so often recommended without understanding that the latter will dissolve traces of paraffin wax in the remover and hence spread it around to later cause the finish to peel or chip readily. The alcohol, however, entirely destroys the film-forming properties of the wax and leaves a surface mechanically correct for further operations, provided that sanding is not necessary.—*Ralph G. Waring.*

Resilvering Mirrors

881. Q.: Where can I obtain information on how to resilver mirrors?—*F. C. U.*

A.: The resilvering of mirrors, while not a difficult job, requires great care and cleanliness. The vessels used for mixing the various solutions must be scrupulously clean. The glass that is to be resilvered must also be carefully cleaned, and care must be taken not to touch it with the hands on the surface to be resilvered after it has been cleaned.

It is necessary to have three separate vessels for mixing the solution. In one of these dissolve 1 oz. of nitrate of silver in 10 ounces of water. In the next one dissolve 1 oz. of caustic potash in 10 ounces of water. In the third, dissolve ½-oz. glucose in 10 ounces of distilled water. To the first solution add drop by drop some strong ammonia until the cloudiness which first appears is just cleared away. Then pour the solution from vessel No. 2 into vessel No. 1 and again add, drop by drop, the ammonia until the liquid becomes clear. Then add solution No. 3. The stirring can be done with a glass rod.

The glass, which is to be resilvered, must be carefully cleaned and then supported absolutely level on a table or bench. If the slightest trace of grease remains on the glass at any place, the deposit, of course, will not adhere. Start in the center and carefully pour the mixture which you have made of the three solutions over the surface of the glass, seeing that all parts of the glass are covered. Gradually it will be seen that a slight film is deposited on the glass. Usually it takes from 30 to 60 minutes to become covered all over. This should be done in a fairly warm room to expedite the deposition of the film.

It might be well to try out this method on smaller pieces of glass until some degree of skill is attained before attempting the resilvering of a large mirror.

Toxicity of Spraying

882. Q.: Are there any poisons or injurious matters in the modern lacquers or quick-drying finishes? Does the spray from the air brush cause any harm when it is inhaled into the lungs? Is the vapor given off by the solvent harmful? As far as the effect on the health is concerned, is it better to use the brush or the sprayer?—*G. V.*

A.: The toxicity of lacquers and their solvents is a much discussed question. Briefly it narrows down to this: Lacquer formulas devoid of benzol can be considered to be nontoxic, as far as the solvents and their vapors are concerned.

The next point to be considered is the matter of ventilation. All spray operations should be conducted in a cabinet of approved design capable of emitting a stack ventilating volume of 450 to 500 cu. ft. per minute to prevent the inhalation of fumes and solids. In case the work to be sprayed is of the box, pocket, or wide-panel type, against which the spray may impign and be deflected back into the face of the operator, then a suitable mask is necessary, simply in order that the

(Continued on Page 22a)

Fulfilling All the Requirements for School Shop Equipment

Three important features of Stanley Electric Drills—*power, light weight and rugged construction*—make them particularly suited for the school shop. The endorsement of many instructors is the best proof of their satisfactory performance.

Used either alone or combined with a drill stand, Stanley Electric Drills will have hundreds of uses in your shop.

Recommended as standard equipment for

Woodworking Shops
Metal Working Shops
Electrical Shops
Machine Shops
Automobile Shops

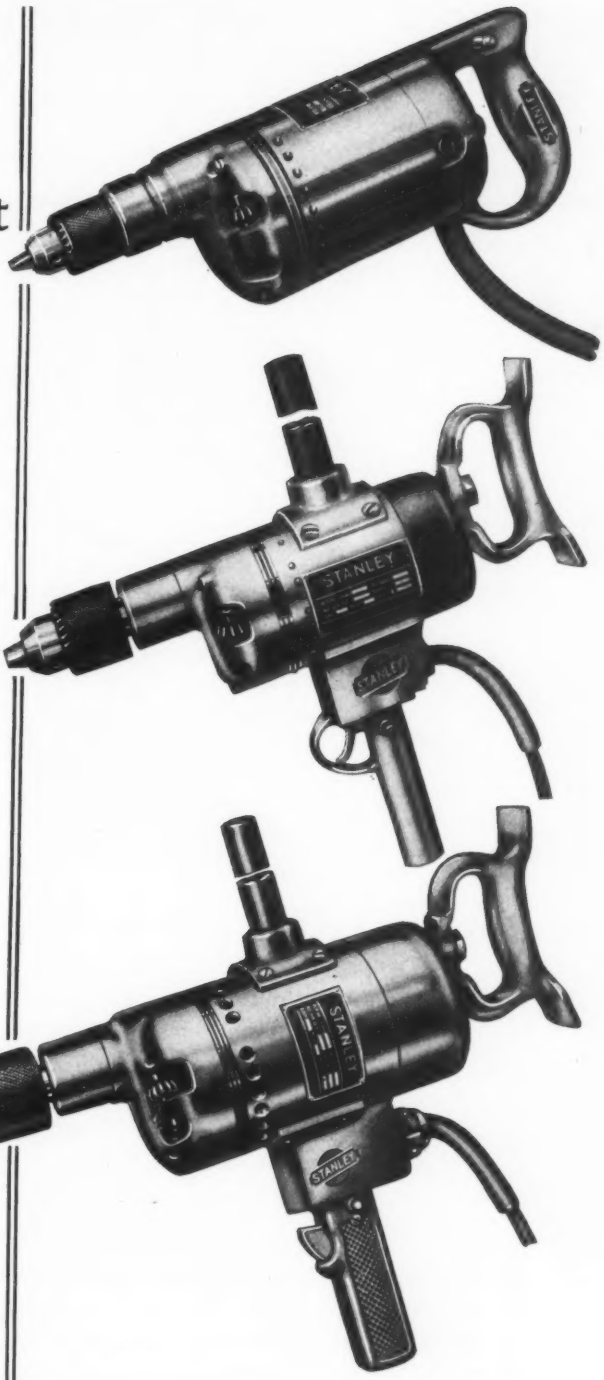
We shall be very pleased to send you a copy of our new catalog No. S59 which describes the full line of Stanley Electric Tools.

THE STANLEY RULE & LEVEL PLANT
Educational Department
New Britain, Conn.

STANLEY TOOLS

STANLEY EQUIPMENT IS STANDARD EQUIPMENT

STANLEY TOOLS



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Valuable Tables

In addition to fulfilling its primary job as the leading textbook on twist drills and drilling practice, the "Handbook for Drillers" contains several valuable tables of Cutting Feeds and Speeds. These tables are in constant daily use in hundreds of the largest machine shops in America.

Copies of the "Handbook," in any reasonable quantities, will be furnished free to supervisors and instructors of industrial and vocational education for use as textbooks by students in machine shop practice.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK·CHICAGO·LONDON SAN FRANCISCO

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

(Continued from Page 284)

respiratory passages may not be coated with solids, a condition which will occur with any pigmented material, be it lacquer, paint, or enamel.

Ten years' observation as a safety engineer on paint-shop practices, leads me to believe that there are no more dangers attached to spraying operations than there are in brush painting, provided in each case that the mechanic observes the requisite amount of common sense attendant on both types of work.

All things considered, I am very much in favor of spray operations as compared to brush work, since much better conditions can, and generally are, provided for the spray operator than for the brush hand.—*Ralph G. Waring.*

AMONG the INDUSTRIAL ARTS TEACHERS

Mr. K. C. Starbuck of Hampton, Iowa, has been appointed head of the manual-training department at Brinnell College.

Mr. John J. Zahorik has been appointed Smith-Hughes director of vocational education at Durand, Wis.

Mr. T. C. Faris of Lebanon, Kans., has been appointed instructor of agriculture in the high school at Arkansas City, Kans.

Miss Ethel Snodgrass, formerly professor of home economics in the Kansas State Teachers College, has been appointed state supervisor of home economics. Miss Snodgrass succeeds Miss Mary Beeman, who resigned to become head of the home-economics department of Ball Teachers College at Muncie.

Mr. J. Ernest Wagner, formerly assistant director of vocational education at Johnstown, Pa., has been elected vocational director, to succeed Mr. James Killius, who retires after a service of ten years.

Mr. Herb Heilig, of Appleton, Wis., has been elected secretary of the Fox River Valley Vocational-School Directors' Association. Mr. William Sullivan, Kaukauna, was elected president.

Mr. E. H. Baetke, of the Milwaukee Vocational School, has been appointed as head of the trade and industrial section of the executive committee for the Wisconsin Vocational Association. He succeeds Mr. H. P. Hurley.

Mr. Dean S. Bellman has been elected instructor in manual training in the high school at Albia, Iowa.

Mr. Perry W. Reeves, of Indiana, has been reappointed as a member of the Federal Board for Vocational Education.

NEW PUBLICATIONS

Free-Hand Lettering Scales—Inclined Gothic

By John F. Faber. Two scales, one for lettering in ink, and the other in pencil, on sheets 12 by 18. Price, 25 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

The author of these scales has succeeded in producing something which will be of great assistance to the teacher of mechanical and architectural drawing, in their objective measuring of the free-hand lettering done in their classes. The scale was scientifically produced and will be found very helpful in the drafting rooms in junior high schools, senior high schools, technical high schools, and part-time and full-time vocational schools, and even in the engineering colleges and universities.

The scales also can be used by the student for self-rating. Each set is accompanied by an explanation of how the scales were chosen out of a total of 20,000 samples.

A Self-Rating Scale for Supervisors, Supervisory Principals, and Helping-Teachers

By Edwin J. Brown, Ph.D. One manual of directions and four scales to each set. Size 15½ by 20¼. Price, per set, 25

(Continued on Page 24a)

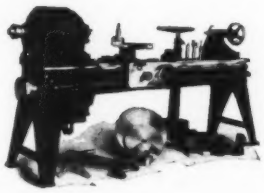
You can't get Violin Music out of a Jews' Harp

. . . . . and you can't learn Woodworking from Toys

IT TAKES real, honest-to-goodness, he-man machinery to click off a heavy production schedule in an industrial shop... and it takes the same kind of stuff to adequately train boys—toy machinery doesn't go!

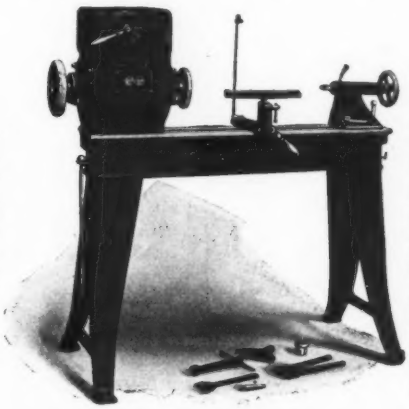
Schools progressed beyond the whittling stage of industrial-arts training long ago and today the tendency is to approximate as closely as possible actual industrial conditions. This means that progressive schools are today replacing the half-size playthings of years-gone-by with modern, up-to-date, *production* machinery. Whenever you see some such catchy phrase as: "this machine will do everything a larger and more expensive machine will do" —look out! Let your common sense tell you that no progressive manufacturing concern would install on its production floor "larger and more expensive" equipment if that were true.

The No. 25 Motor Head Pattern Lathe is most practical for Pattern Making. Swing is 16" or 13" over carriage and larger; takes 60" or more between centers. The D. C. model has 2 H.P. motor with C. H. controller giving 20 speeds from 400 to 2000 r.p.m. A. C. model has 3 H.P. motor for 600, 1200, 1800, or 3600 r.p.m.



These Progressive Schools Use the "Oliver" No. 25

School No. 29, Baltimore, Md.
Boys' Vocational School, Newark, N. J.
University of Wisconsin, Madison, Wis.
Board of Education, Fordson, Mich.
John Harris High School, Harrison, Pa.
Independent School Dist. No. 40, Chisholm, Minn.
Peckham Vocational School, Buffalo, N. Y.
Board of Education, Aurora, Minn.
Board of Education, Bay City, Mich.
Carnegie Inst. of Technology, Pittsburgh, Pa.
Michigan State College, Lansing, Mich.
College of Agriculture, Mayaguez, P. R.
High School, Nashville, Tenn.



"Oliver" No. 51 Unit Type Headstock Lathe for Alternating Current giving 4 speeds is illustrated. The most flexible and most modern of all speed lathes is the Adjustable Speed type. It is instantly adjustable to any speed between 600 and 3600 r.p.m.—an exclusive "Oliver" feature. It can be connected to 1, 2 or 3 phase, 110 or 220 Volt A. C. of any cycle.

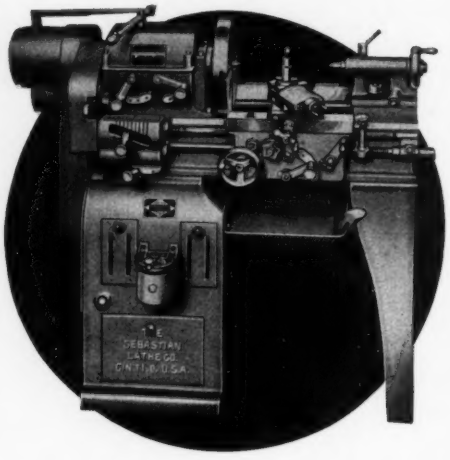
The first Motor Head Lathes ever made were designed and built by "Oliver" for the Old McKinley High School of Washington, D. C. Since 1906 these lathes have been in constant use and they are still going strong. Distributing their cost over a period of 23 years illustrates beyond logical argument, that no machinery is so cheap as good machinery. As testimony of the type of service rendered by this original installation, we submit the recent order for eleven "Oliver" Motor Head Lathes for the New McKinley High School at Washington, D. C. (Shipped in May, 1929.)

Oliver Machinery Company
Grand Rapids, Michigan, U.S.A.
HIGH GRADE MACHINERY

An "Oliver" No. 18-A Special Wood Turning Lathe, 32 inch swing; bed, 62 feet long. Designed and built by the Oliver Machinery Company on special order for the U. S. Government. In the big shops where things are done as nearly right as man can do them, you will find "Oliver" Machinery in use.

New Lathes for Next Fall's Classes

If they are bought on these specifications you are ASSURED of ABSOLUTE SATISFACTION



(....) Lathes Gold Seal or equal—Swing 11", bed length 4', to be 8 speed geared head, full quick change box with no loose gears, to cut threads 6-96, feeds .00175 to .111, all steel gears, 1 5/16" hole through spindle, collet capacity ⅞", bearings of main spindle 2⅞x2¾—1⅞x2¼", to be taper gibbed throughout, motor drive with motor fitted in leg under headstock with a tool cabinet in the leg below the motor compartment, tumbler yoke for cutting left-hand threads with the depth of the teeth already adjusted on the quadrant for throwing over to a left-hand thread, lathe to be bronze bushed wherever required. Macit tool post screw. Silent chain drive with easy adjustment for stretch in the chain, lathe to be fitted with a safety shearing pin, graduated compound rest and tailstock bases, tailstock center oiler, friction type collars on compound rest and cross feed with these collars graduated, accuracy alignment test .0005, motor and control to be (Specify here type current and type of control wanted). Each lathe to be furnished with a chip pan, depth thread chasing stop, centers, thread chasing dial, steady rest, and wrenches. The lathes shall all be furnished with all gears guarded by cast iron guards, and the operation of the lathe for stop and start shall be through a friction on the headstock controlled by a lever within easy reach of the operator so that the motor can run constantly when machine is in operation. The apron of the lathe shall have a safety device to prevent both longitudinal feeds being thrown in at the same time.

Add here list of extras wanted such as, Chucks, Taper Attachment, Draw-in Attachment, Collets, Tools, Dogs, etc.

Tell us your lathe requirements. We will be glad to send literature on Sebastian Gold Seal Lathes

THE SEBASTIAN LATHE CO.
CINCINNATI, OHIO
NEW YORK OFFICE - Room 372 - 50 Church St.

(Continued from Page 22a)

cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

This scale consists of two parts: Part I on personal and social qualities, and Part II on methods and principles. Each one of these parts is divided into a number of subdivisions and each of these are again subdivided into their elements. They will be very helpful to the person who really wants to improve himself in his profession. A manual of directions accompanies the scale.

Methods and Teaching Problems in Industrial Education

By F. Theodore Struck, Ph.D. Cloth, 214 pages, 5¾ by 8¼. Price, $2.75. Published by John Wiley & Sons, Inc., New York, N. Y.

This is an exceedingly helpful book to the industrial-arts and vocational teacher. A set of questions and problems are found at the end of each chapter, as is also a refereence list of selected reading. Special methods and devices used, such as the shop project, production method, and individual instruction sheet, the Dalton plan, the modified general shop, etc., are briefly but clearly explained. The difference between the problems arising in the full-time and part-time school also is very thoroughly discussed.

25 Kites That Fly

By Leslie L. Hunt. Cloth, 110 pages, 5¾ by 8⅞, illustrated. Price, $1.25. Published by The Bruce Publishing Company, Milwaukee, Wis.

This book will delight any boy between the ages of 10 and 60 who is at all interested in the noble art of kitemaking and kite flying. The book contains specific directions for making every conceivable type of kite. It also describes a novel device which can be readily made and by which the altitude of the kite can be obtained.

Shop Drawing for Beginners

By H. B. Cobaugh. Paper, 32 pages, 6 by 9, illustrated. Price, 24 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

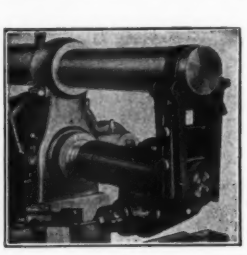
In the 32 pages comprised in this little textbook, the author has compressed a multitude of drawing problems which will assist the beginner. Each process in mechanical drawing is introduced at the proper time with numerous examples and the explanations, while brief, are quite adequate. It is a fine little text for the junior high school and the part-time vocational school, and any other drafting class where the mere rudiments of drawing and sketching are to be taught without going into the instrumental drafting. It should receive wide acceptance for classes in related drawing.

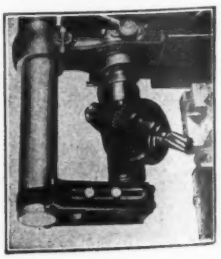
School Shop Equipment News

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

NEW CATALOG OF PORTER-CABLE MILLING ATTACHMENTS

The Porter-Cable Machine Company of Syracuse, N. Y., has issued a new catalog of 24 pages, illustrating and describing new attachments for hand and power feed, single and double overarm, high- and low-speed milling machines. These new attachments are the result of twenty years of experiment and





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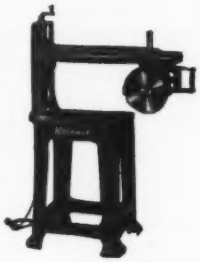
are intended to extend the range and capacity of milling machines. The attachments are adaptable to any standard miller and may be used on any radius, angle, form, and tee-slotting cutters.

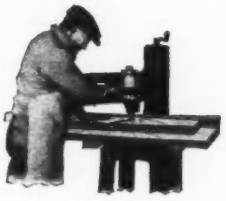
The catalog also lists carbon-steel, and high-speed end mills, tapered radius end mills for pattern and die work, Ford hand-cut rotary files, high-speed production lathes, and belt grinders and sanders.

NEW WALLACE RADIAL SAW

The J. D. Wallace Company, of Chicago, Ill., has just placed on the market a new versatile saw, which embraces many unique utilitarian features which will be helpful for use in the carpenter and woodworking shops.

This new machine is known as the Workace Radial Saw. It is portable, and may be moved to suit the location of the work. It is adapted for straight cut-off work, as well as for crosscutting, ripping, dadoing, grooving, rabbeting, routing, and shaping work.

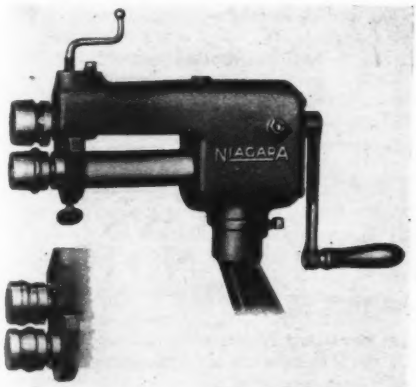




The saw and motor unit are mounted on a turntable 6 in. in diameter, which in turn is mounted on two heavy steel rods placed 5 in. apart to prevent any spring. The radial arm is mounted in a pedestal on a turntable 10 in. in diameter, permitting the arm to be set in any position. The pedestal is also mounted on a turntable 10 in. in diameter. By means of these turntables the machine is readily placed in position for any kind of cutting. With an 8-in. blade it cuts 2½ in. deep; a 9-in. blade cuts 3 in. The saw travels 19½ in. in the arm and is adjustable vertically 5¾ in. The motor is the ball bearing, universal type, General Electric make. The speed is reduced to the proper sawing speed by gears. The saw bearings are made of bronze; lubrication is automatic force-feed. In operation, the machine saves from 25 to 50 per cent in time, with considerable savings also in investment, operation, and maintenance.

NEW NIAGARA BEADING MACHINE FOR SHEET-METAL WORK

The Niagara Machine & Tool Works of Buffalo, New York, has just placed on the market its new No. 194 Niagara beader for use in beading operations on sheet-metal work.



The machine is sturdy in construction, with a one-piece inclosed frame combining safety features and insuring long life and service for the machine. The machine is arranged for

(Continued on Page 28a)

Photograph by permission Pitcairn Aircraft, Inc. "Yankee" Ratchet Drill in use, on Pitcairn Super-Mailwing, by John Van Winkle, who says, "I have used 'Yankee' Drills and Screw-drivers for eight years in Aircraft work and found them very satisfactory; and convenient in close quarters."

"..when accuracy is at stake"

ONLY a "Yankee" Ratchet Drill is good enough—when accuracy is at stake!

A "Yankee" Drill gives you the "feel" of the work.—

It gives you control of drilling, every instant and down to the smallest fraction of a revolution.

With a "Yankee," you drill fast or slow at will. Change gears, high power or low, or change ratchet adjustments, at a finger-touch; and without removing drill from work.

In tight places, "Yankee" Double Ratchet brings work out into the open and speeds it up; any slight motion of crank, forward and back, drives drill continuously.

No. 1555 (illustrated).—Length, 17 in. 3-jaw; ½-in. Double Speed. Also, 2-in. jaw. Price, $11.00.

No. 1545.—Hand Drill. Length, 16 in. 3-jaw; ⅜-in. Double speed. Also, 2-in. jaw. Price, $10.00.

No. 1530.—Hand Drill. Length only 10½ in. but has same ratchet adjustment as large drills. 3-jaw; ¼-in. Single speed. Price, $5.25.

Eighteen styles of "Yankee" Breast and Hand Drills, at prices from $3.00 up. Ask dealer for "Yankee."

WRITE us for "Yankee" Tool Book, free. Illustrated from photographs showing "Yankee" Tools in use: Ratchet Breast, Hand and Chain Drills; Automatic Bench Drills; Ratchet Tap Wrenches; Ratchet Braces; Spiral and Ratchet Screw-drivers; Removable-base Vises.

North Bros. Mfg. Co., Philadelphia, U. S. A.

"YANKEE" TOOLS

Make Better Mechanics

Irwins *for* SPEED

. . . . they bite; they cut; they spew out the chips . . . the hole is made.

Irwin Bits make holes cleaner, quicker, accurately. Your student craftsmen get the "feel" of good tools that stays with them all their useful lives when they start in with such tools as Irwin Bits.

When you insist on Irwin Bits for your shops you are starting these young men with a love of fine tools, good workmanship . . . a sense of the eternal fitness of things that will serve them well in years to come.

Have you had our special charts for the Industrial Arts instructor? And the booklet "How to select, use and care for Bits"? We would like to send them to you.

THE IRWIN AUGER BIT COMPANY
WILMINGTON, OHIO

Sole manufacturers of the Genuine

The IRWIN Bit
Reg. U.S. Pat. Off.

(Continued from Page 27a)

direct drive and will handle up to No. 24 gage metal. A throat of 7 in. from the center of the rolls to the frame is provided, and each roll is 1 15/16 in. in diameter, with a length of 1½ in. The upper shaft is raised and lowered by means of a quick-acting crank screw, and the bearings are large, accurately fitted, and provided with easy means for lubrication. The rolls are of high-grade steel, casehardened, and are held in place with countersunk screws, which keep the faces of the rolls flush with the ends of the shafts.

The beader may be obtained complete, with one pair of ¾-in. O. G. beading rolls, one pair of 5/16-in. single beading rolls, a bench standard, and a wrench. Single beading rolls in three different sizes may be obtained for use in straight crimping and spiral crimping. Instructors in sheet-metal shops will find the Niagara beading machine serviceable and durable for various beading operations.

ANNOUNCE NEW FINISH FOR WOOD SURFACES

Modern wood finishers think they have exhausted every idea in wood finishing. The woodwork in our homes and public buildings in a great many cases has been suppressed instead of expressed. In our endeavor to speed up the work of eliminating the "raw" look of our wood, we daub it over with a film of varnish or lacquer and call it a finish.

The Egyptians used repeated coats of oil and fossil gums; the early French, Germans, and English used shellac, flax oil, and wax, respectively, but modern conditions make it impossible to employ these laborious processes.

The American Crayon Company of Sandusky, Ohio, has placed on the market a new finish under the trade name of "Permantite," which gives the beautiful finish of early times with a minimum of time, effort, and expense. The application of this liquid to any wood surface leaves it completely sealed, easily polished, and produces a silky finish, with every figure clearly brough out. Permantite is the product of years of research on the part of this firm. It has been used with equal success in large public buildings and private homes.

Complete information and prices may be obtained upon application to the American Crayon Company, at Sandusky, Ohio.

MR. NEWING PROMOTED

Mr. Ralph L. Newing, formerly manager of the educational department, has been promoted to the position of manager of the textbook sales department of the International Textbook Company at Scranton, Pa.

Mr. Newing will maintain his headquarters at the office in Scranton, and will continue to use the title of manager of the educational department which he had held for the past twelve months.

OLIVER COMPANY ANNOUNCES CHANGE IN SEATTLE OFFICE

The Oliver Machinery Company, of Grand Rapids, Mich., has announced a change in the Seattle office and agency. The new western office will be located at First Avenue South and King St., and will be conducted in connection with the Perine Machinery Company, Inc.

The latter firm has been reorganized with Mr. W. H. Payne and Mr. S. W. Fuertel as members of the firm.

The company will carry a large stock of Oliver machinery on display at the new office where increased and improved facilities have been provided.

NEWS AND NOTES

New Film on Plant Material.

The U. S. Department of Agriculture, Washington, has announced a new three-reel motion picture of plant material. The film shows foreign plant material shipped into the country, plant introduction, gardens, naturalized plants, and scenes in wheat-raising countries. Some of the interesting products shown are the Washington navel orange, the oriental

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persimmon, the date, and the Barouni olive. The film may be obtained by writing to the U. S. Department of Agriculture, Washington, D. C., and inclosing the transportation charges.

St. Louis Will Erect New Vocational School.

Eleven members of the school board of St. Louis recently completed a tour of inspection of vocational and technical schools in the north and east, to obtain the latest and best ideas for use in the new vocational school. The building will be erected at a cost of $3,700,000.

Boys Construct Furniture at Youngstown, Ohio

The bench woodworking class in the prevocational school at Youngstown, Ohio, is composed of boys of all grades in the junior high school who have not had shop training. During the past semester the boys of the 7B group composed of six classes, made numerous pieces of furniture. The boys have turned out a variety of tables, and some pieces in upholstery have been constructed.

Hold Vocational-Guidance Conferences at La Crosse, Wis.

Seventy local business and professional women spoke to students in vocational-guidance conferences in the Central, Logan, and Lincoln high schools and the Vocational School of La Crosse, Wis., on May 7. Supt. G. M. Wiley explained the important part the business and professional men and women of the city play in the educational life of the students in the high and vocational schools.

Miss Josephine Hintgen, director of vocational guidance in the La Crosse schools, told of the use of the questionnaire and the cumulative record card. Outside business interests and associations of the grade- and high-school students were noted and studied.

Mr. B. E. McCormick, secretary of the Wisconsin Teachers' Association, and editor of the Wisconsin Journal of Education, gave a series of addresses in the high schools on vocational-guidance work. Other speakers were Mr. C. C. Robinson, who talked to the students of Central High School, and Mr. Louis Robinson, who with Mr. McCormick talked at the Logan, Lincoln, and Vocational schools.

Vocational Education to Receive Large Sum from Congress

The revised vocational-education bill, recently approved by the House of Representatives, provides for an aggregate of $2,500,000 of additional funds to be spread over a five-year program. The bill provides for an initial appropriation of $500,000 for the fiscal year ending June, 1930, and for each year thereafter, for four years, a sum exceeding by $500,000 the sum appropriated for each preceding year.

The appropriations under the terms of the bill will provide for extensive work in agriculture, home economics, and similar appropriations by the several states. These will be in addition to those made for vocational education under the law of 1917.

Vocational Guidance for Boys in High School

Boys attending the high school at Highland Park, Mich., have been provided with expert vocational guidance through a plan supported by the high school and local Y. M. C. A. organization. During the week of May 20, the high-school hi-Y club put on a vocational-guidance program, with talks by local business and professional men on suitable vocations for boys. Boys desirous of having information about special lines of work were interviewed by the faculty adviser of the hi-Y club of the school.

Boys Build Switchboard at Cleveland, Ohio

The stage switchboard for the East Technical High School at Cleveland, Ohio, was designed by boys in the optical-projection classes, and is an impressive arrangement of switches, plugs, and wires. The switchboard is the largest single undertaking of the stagecraft classes. It took a year and a half to complete, and cost $300. The cost of the work was financed from the optical-projection fund, which is maintained by students who operate moving-picture machines out of school.

The project offered practical work for the students and provided training and valuable experience in electrical construction. The classes devote their time to stage lighting, scene construction, operation of moving-picture machines, and other phases of stage mechanics.

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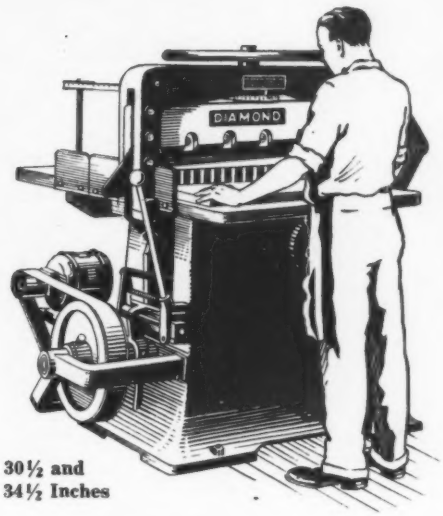

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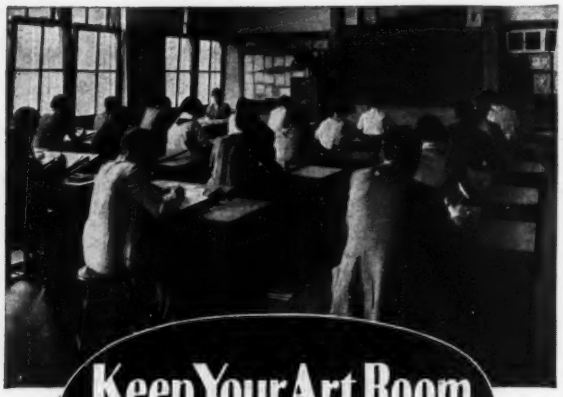

Keep Your Art Room BUSY ALL DAY

Kewaunee Art Tables Will Accommodate Eight Classes

The art room or mechanical drawing room should be used every period of the day the same as other classrooms. To enable all day use of art and mechanical drawing rooms we have designed a table that provides individual accommodations for eight pupils.

This table is known as Art Table No. 205. It has four compartments that open to the front and four to the rear, holding drawing boards and other equipment. Rooms equipped with these tables can handle the greatest possible number of pupils at one time.

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We also make a Drawing Table to accommodate six students. It contains six separate compartments for individual use. It is one of our best sellers—it is very roomy and comfortable, with adjustable top.

Kewaunee Drawing Tables are all designed for the greatest compactness, comfort and convenience. They are firmly constructed to insure rigidity for long service under rough student usage.

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ADRIAN, MICHIGAN

Kewaunee

(Continued from Page 31a)

New Vocational School at Sandersville, Miss.

A new vocational school was recently completed at Sandersville, Miss.

Vocational Class Completes Cedar Chests.

The manual-training class at Goodlettsville, Tenn., has completed ten cedar chests which were made for persons in the community.

Third Flying Contest for Airplane Builders.

The Playground and Recreation Association of America, 315 Fourth Ave., New York City, has recently announced the third national playground miniature aircraft tournament to be conducted during the present summer. The contest is open to boys and girls up to 21 years of age. It will close in October, with the national finals at Louisville, Ky.

The three competitors winning the largest number of points in both senior and junior classes in the Louisville finals will be awarded silver cups donated by the magazine "Popular Aviation and Aeronautics." Seven outdoor and four indoor events for different types of planes are provided for in the rules of the competition. Models launched by hand, rising off the ground, and rising out of the water are called for. Many planes will be driven by rubber motors, and others by springs, rockets, and compressed air. No cash awards will be made, but champions in the individual events will be given medals.

Five Thousand Enter Airplane Contest in Kansas City, Mo.

A total of 5,000 boys will participate in the miniature airplaine contest to be held in Kansas City beginning June 8. The contest is conducted under the rules of, and is sanctioned by the National Aeronautical Association. The classifications are as follows:

Class A—Boys under 12, flying models.
Class B—Boys 12 to 15, scale flying models.
Class C—Boys 15 to 18, scale models, nonflying.
Class D—Most original idea in aircraft.
Class E—Best plane made from manufactured material.

Under the rules, only one model may be entered in each of the various classes.

Motion Picture of the Story of the Spark Plug.

A two-reel educational motion-picture film has recently been issued by the U. S. Bureau of Mines, Department of Commerce, entitled "The Story of the Spark Plug." The film is designed to illustrate the dependence of the Nation on the internal combustion age as a means of providing transportation and keeping industry in motion. Animated photography is used in showing the spark plug in the operation of an engine. The manufacture of steel shells, brass caps, and nickel alloy electrodes is shown, as well as the assembling of the different parts of the completed spark plug. Copies of the film may be obtained by addressing the U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.

Motion-Picture Film of Oil Fields.

"Through the Oil Fields of Mexico" is the title of an educational motion-picture film, issued by the U. S. Department of Commerce. The film which is in three reels, visualizes the drilling of oil wells in Mexico, and depicts the stages in the transportation, storage, and refining of petroleum in Mexico. Copies of the film may be obtained for exhibition purposes by addressing the Pittsburgh station of the U. S. Bureau of Mines, Pittsburgh.

Oklahoma City Industrial-Arts Club Holds Meeting.

The Oklahoma City Industrial-Arts Club held their regular meeting on March 6. At this meeting, Mr. N. R. Lago, of the Central High School, talked on "The Aims and Objectives of Mechanical Drawing in the Junior and Senior High Schools."

Committee Named to Study Methods of Teaching Vocational Education.

Mr. Bruce B. Bell, director of vocational education at East Chicago, Ind., has been named a member of the state committee which is to study the best methods of teaching vocational education. Other members of the committee are: Mr. H. F. Briskley, Muncie; Mr. F. Barrows, Hammond; Prof. Swope, Purdue University; and George K. Wells, state supervisor of vocational work.